Rheem Australia Pty Ltd

ABN 21 098 823 511

SERVICE INSTRUCTIONS

310 Series Heat Pump

TM025

Revision: B

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551310

Contents

Safety Warning

The purpose of this Service Manual is to provide sufficient information to allow a person with the skills as required by the controlling Regulatory Authorities to carry out effective repairs to a Rheem 310 series Heat Pump Water Heater in the minimum of time.

Safety precautions or areas where extra care should be observed when conducting tests outlined in this manual are indicated by print in ***bold italics*** and/or a warning symbol. Take care to observe the recommended procedure.

Certain diagnostic procedures outlined in these service instructions require "live" testing to be conducted. Wear Personal Protective Equipment (PPE) when conducting these tests to prevent the risk of electric shock. (Refer to the Rheem Safety Procedure on electrical testing)

R134A is a controlled substance under the fair trading act. Personnel qualified and licensed to work with refrigerants may only carry out service and repair to the sealed refrigeration system. During repair the refrigerant must be recovered, not vented to atmosphere.

Environmental

At the end of the service life of a Rheem heat pump the refrigerant must be recovered by personnel qualified and licensed to work with refrigerants prior to the unit being disposed of. Refrigerants must not be vented to atmosphere.

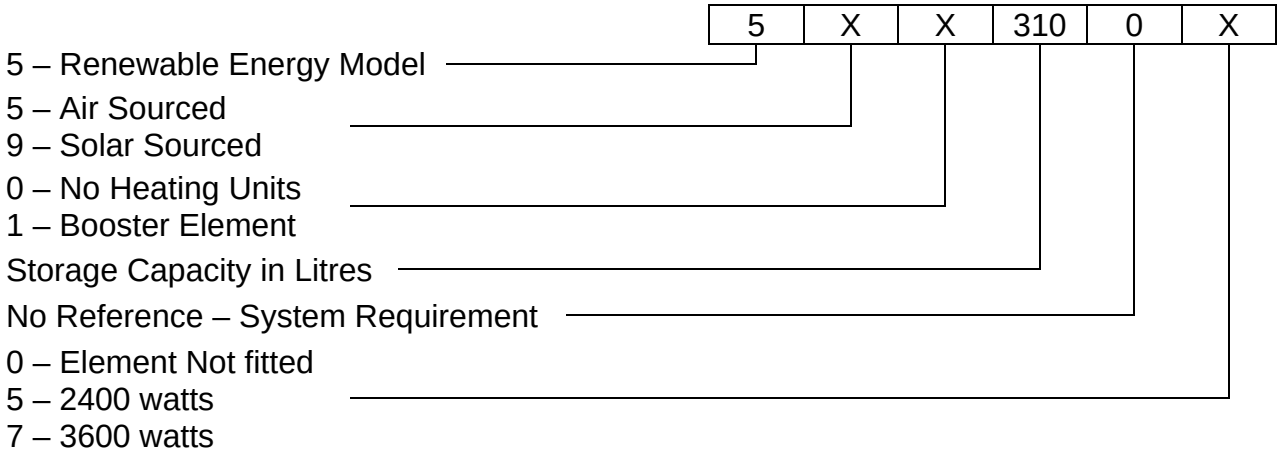
Introduction

The information provided in these instructions is based on the water heater being installed in accordance with the Installation Instructions provided with each water heater.

Should you require further technical advice on a Rheem 310 Series Heat Pump Water Heater, contact your nearest Rheem Service Department where all genuine replacement parts are also available.

Heater Model Identification

All identification numbers are designed to convey detailed information about the water heater to which it is attached. The model number consists of 8 digits.



Note: Model number, serial number and date of manufacture should be quoted in all correspondence.

Specifications

Water Heater

		Model	551310
Capacity - Litres			310
Boost Capacity - Litres			220
Booster element rating - kW			2.4 or 3.6
T&PR valve Rating - kPa			1000
Maximum inlet pressure - kPa	With ECV		680
	Without ECV		800
Water Connections	Inlet / Outlet		RP¾/20
	T&PR		RP½/15
Anode	Quantity		1
	Length		1153
Control board thermostat setting (fixed)			60ºC
Limp mode mechanical thermostat setting			70ºC
Mechanical thermostat ECO setting			88ºC

Refrigeration System

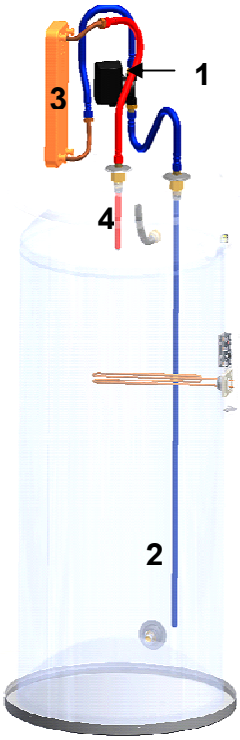
Parameter	551310
Sound rating	51 dBA @1.5m
Superheat setting (Factory)	+6ºC at 10ºC Evaporator temp.
Refrigerant charge R134A	1050 grams
Compressor internal OTC	Open 150ºC. Close 90ºC (automatic reset)
Compressor winding resistance	Run winding - Red & Blue: 2.2 ohms at 20ºC Start winding - Red & Black: 3.27 ohms at 20ºC
Compressor Capacitor	35µF 240 VAC 50HZ
Fan winding resistance	Run winding – Black & Brown: 184 ohms at 20ºC Start winding – Black & Blue: 238 ohms at 20ºC
Fan Capacitor	2µF 240 VAC 50HZ
Circulator winding resistance	75.3 ohms @ 20ºC

Preventative Maintenance

It is suggested for peak performance that the water heater be serviced annually.

1. Check for discharge from the T&PR valve. When the element or heat pump is operating a small discharge of water may be evident. Operate the valve-easing lever to ensure the valve opens and resets properly. Always open and close the valve gently. The T&PR valve should be replaced at 5 yearly intervals.
2. Check for leaks at all cylinder fittings.
3. Check for signs of excessive corrosion on the water heater jacket.
4. ***Isolate power*** to the water heater and check all electrical connections for signs of overheating due to poor connection.
5. Conduct an 'Electrical insulation test' on the water heater (refer to page 46).
6. Check evaporator fins and fan blade for build up of dust or debris.
7. Check for sludge build up and if necessary drain and flush tank.

Operation – Water System:



The heat pump utilises a form of heating called 'top down' heating. The circulator **(1)** draws cooler water from the bottom of the cylinder via the long dropper tube **(2)**. The water passes through the heat exchanger (condenser) **(3)** where it is heated by the refrigerant and is then returned to the top of the cylinder via a short dropper tube **(4)**.

Operation – Heat Pump Mode:

During normal operation in *'heat pump'* mode the electronic controller (control board) holds a control relay in the energised state and power for the compressor is passed to an electronic switch (called a triac) via the normally open relay contact.

The operation of the compressor causes a pressure difference within the sealed refrigeration system. This pressure difference causes the refrigerant to move around the sealed system. The refrigerant enters the evaporator **(5)** as a liquid, as the refrigerant absorbs heat from the atmosphere it changes state, at low pressure, from a sub cooled liquid to a super heated vapour or gas (evaporates). The vapour then enters the compressor **(6)** and obtains more heat, known as heat of compression, and passes into the heat exchanger as a super heated vapour at high pressure.

As the refrigerant passes through the heat exchanger it gives off heat which is absorbed by the water flowing through a separate chamber inside the heat exchanger. As the refrigerant gives off heat it cools and changes state back into a liquid (condenses). The refrigerant then enters the evaporator again and the cycle is repeated.

Operation – Boost Mode:

The controller will enter '*boost'* mode when atmospheric conditions are unsuitable for heat pump operation or a possible failure of the refrigeration or water circuits has been detected. The following error conditions will initiate *boost* mode:

1. The temperature sensed by the ambient air sensor is below 0°C.
2. The water leaving the heat exchanger is greater than 80°C.
3. The compressor discharge temperature is greater than 110°C.
4. The evaporator temperature is less than -3°C.
5. The failure of sensors S3, S4 or S5.
6. The compressor is not running based on either of the following conditions:

    a. After 2 minutes in controller sequence 3 the compressor discharge temperature has not risen 15°C above ambient.

    b. In controller sequence 4 the water temperature rise across the heat exchanger (condenser) is less than 8°C.

In *boost* mode the electronic controller continues to control the temperature of the water in the cylinder and the circulator however the control relay is de-energised switching the power supply from the compressor triac to the element.

Boost mode allows 220 litres of 60ºC hot water to be provided by electric boosting. During this mode the circulator will cycle on and off periodically allowing for the 220 litre boost capacity rather than just the amount of water above the element as is the case with a conventional electric boost system.

Once a heating cycle is completed the error is cleared and normal operation is resumed on the next call for heat.

Note: If sensor S4 fails the system will operate on boost mode however the temperature will in this case be controlled by the mechanical thermostat and 220 litres of 70ºC water will be available.

Operation – Limp Mode:

Limp mode will only occur due to the failure of both sensors S1 and S4.

In *limp* mode the electronic controller no longer controls the operation of the heat pump and both *'heat pump'* mode and *'boost'* mode are rendered inoperable. The control relay is de-energised switching the power supply from the compressor triac to the element.

Limp mode allows 111 litres of hot water to be provided by electric boosting and the water temperature is controlled by the mechanical thermostat which is set to 70°C; in this condition only the water in the zone above the element is heated as the circulator does not operate.

It should be noted that if sensor S1 fails and sensor S4 is operational the system operates in boost mode however the circulator cannot operate. In this case the end result is an operation similar to limp mode in which 111 litres of water is heated by the booster and the temperature controlled to 70ºC by the Robertshaw thermostat.

Electronic Controller

The main features of the electronic controller (control board) are shown on the diagram opposite. The inputs to the software are shown in blue and the outputs that control the heat pump are shown in red.

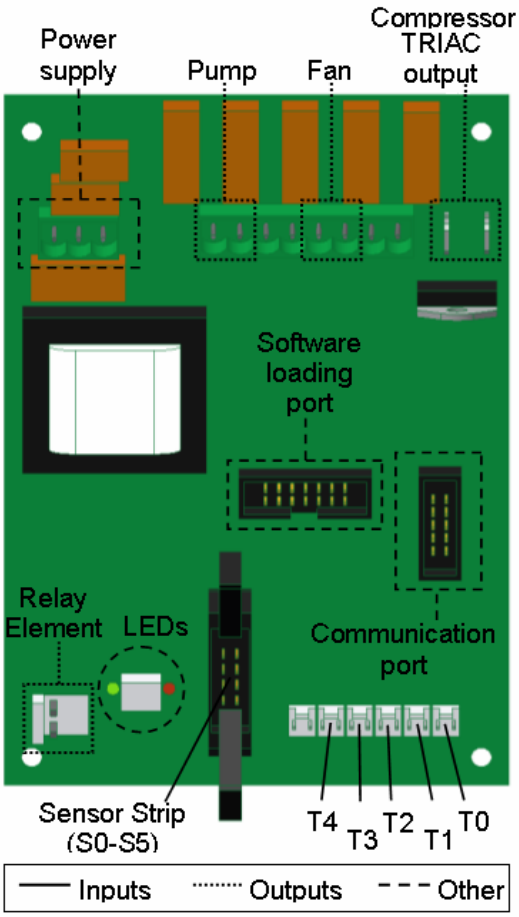
The connection marked "relay element" energises or de-energises a relay that switches from heat pump heating to electric element heating when the system operates in "boost" or "limp" mode.

The "Compressor TRIAC" switches the power to the compressor on and off.

The "Communication port" can be used in conjunction with a computer to read the inputs and outputs from the software. This information may be logged using specially designed logging software (Contact Rheem Service for more information regarding this software).

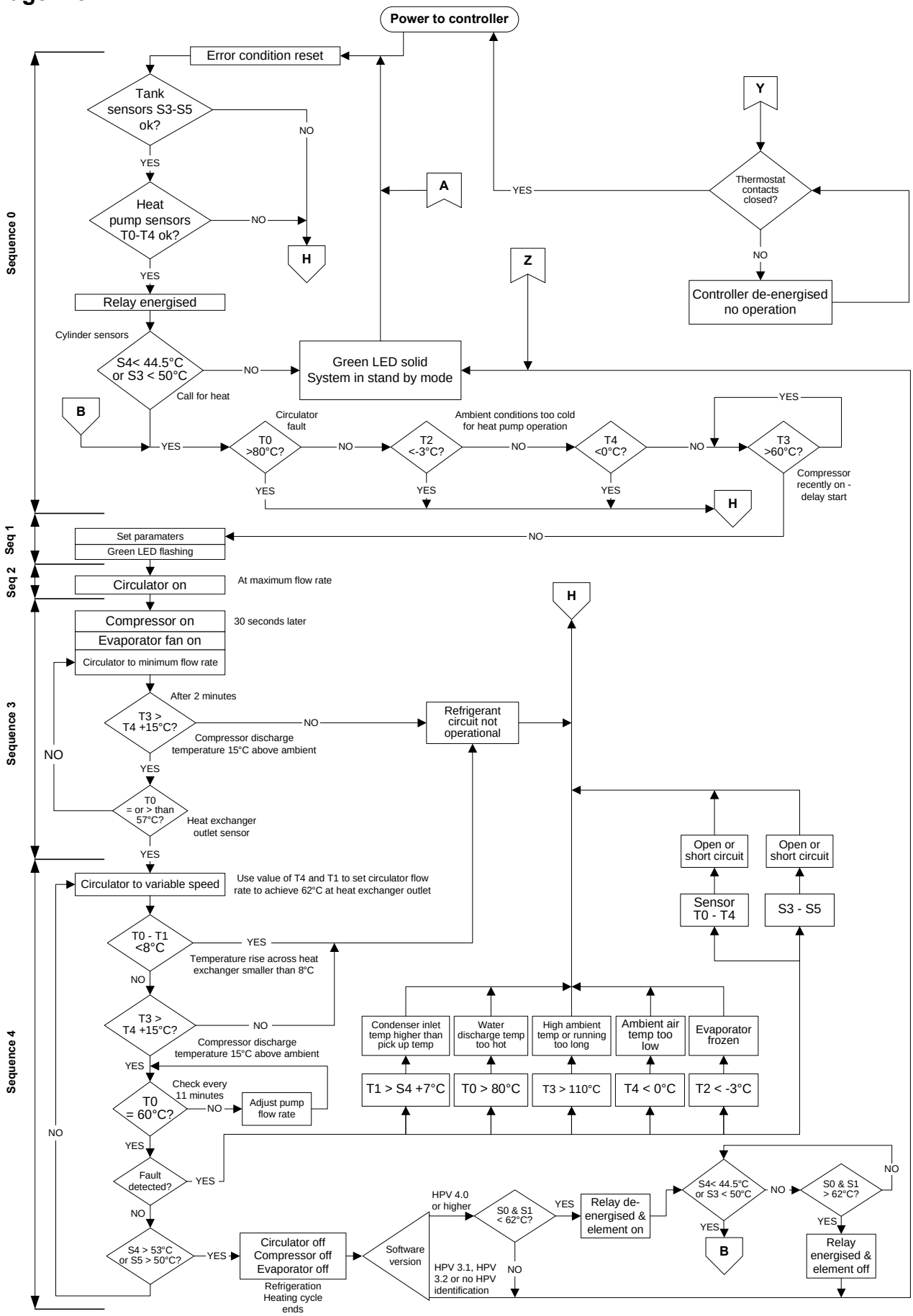
The "Software loading port" is only used for loading software on to the control board.

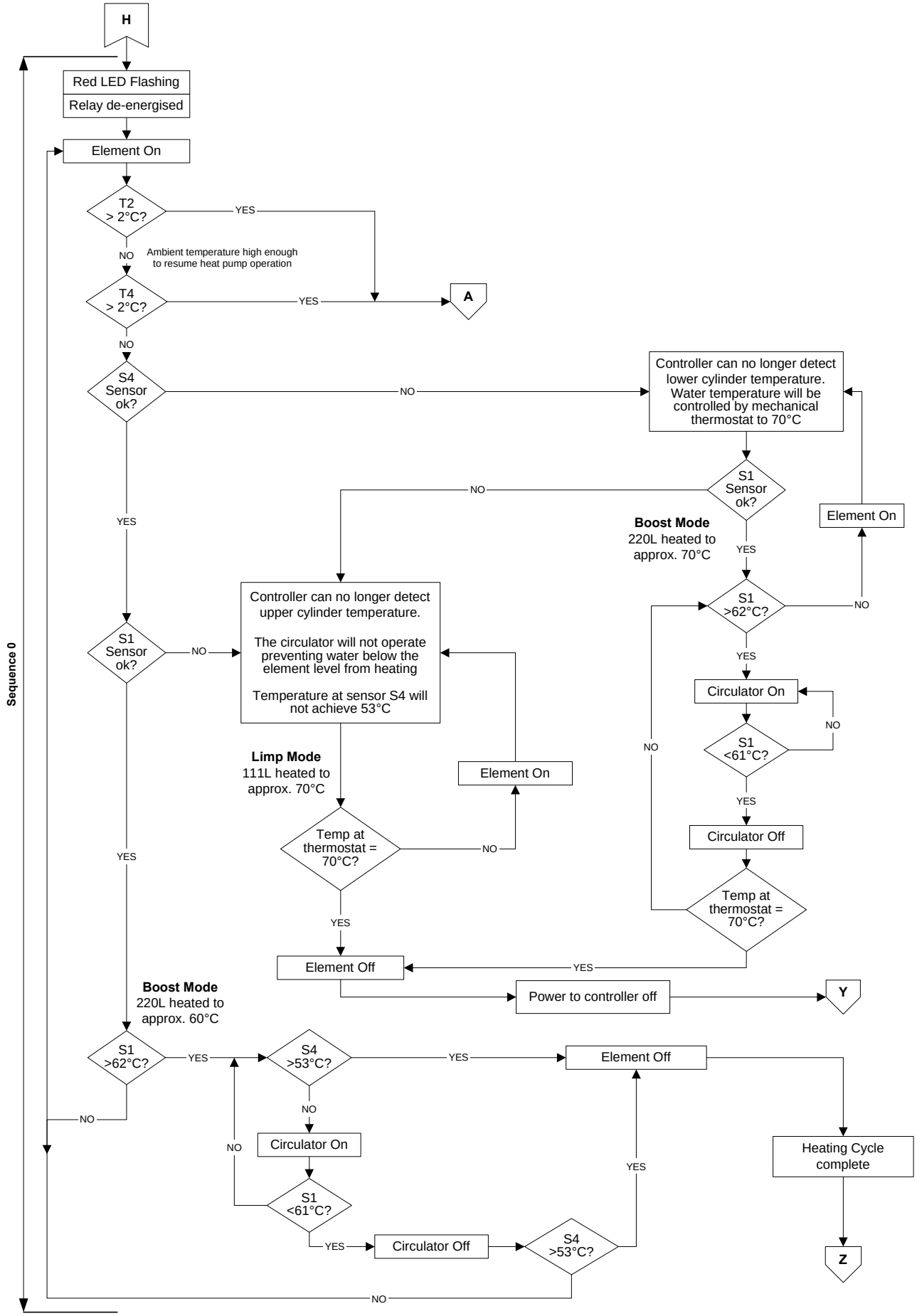
The green and red LED's indicate the condition of the heat pump (refer to the section titled "LED Indication" on page 12).



Operating Sequence Flow Charts:

Page 1 of 2:





Refrigeration Terms and their Meaning

Sub Cooled Liquid – A substance below its saturation temperature at a given pressure.

Super Heated Vapour – A substance above its boiling point at a given pressure.

Saturated Vapour – A substance at its boiling point at a given pressure.

Latent Heat – Hidden (invisible) heat removed or added to a substance that results in a change of state (i.e. liquid to a vapour) without an increase or decrease in temperature.

Heat of Compression – The additional heat added to a substance by the act of compressing it.

Low Side – Components and pipe work of a refrigeration system operating at low pressure, generally considered to be the evaporator, suction line and accumulator.

High Side – Components and pipe work of a refrigeration system operating at high pressure, generally considered to be the condenser, discharge line, liquid receiver/filter drier and compressor case where a rotary compressor is utilized.

Boil Off – The action of a substance as it absorbs heat and changes state (evaporates) from a liquid to a vapour (gas).

Give Up Heat – The action of a substance as it releases heat and changes state (condenses) from a vapour (gas) to a liquid.

Components and their Function

Temperature and Pressure Relief Valve - A valve designed to provide automatic relief by discharging water in case of excessive temperature, pressure or both.

Never fit a T&PR Valve with a pressure rating greater than that indicated on the product-rating label.

Pressure Limiting Valve (P.L.V.) - A valve that controls its outlet pressure to a predetermined limit.

Outlet Delivery Tube (Dip Tube) - A plastic tube installed in the hot water outlet of the water heater cylinder to conduct water from the highest point to the outlet connection. It also acts as a fitting liner.

Diffuser - A plastic device installed in the cold water inlet of the water heater cylinder to assist with stratification. It also acts as a fitting liner.

Fitting Liner - A plastic tube installed in the cold-water inlet of the water heater to provide protection against corrosion through the life of the water heater.

Anode (Sacrificial) - A metal alloy electrode installed in the water heater cylinder that by galvanic action protects the cylinder from corrosion.

Thermostat - A device responsive to temperature that controls the supply of electrical energy to the compressor, which results in the stored water being maintained at the required temperature.

Evaporator Thermistor - A device responsive to temperature that controls the active supply between the compressor circuit and the booster element circuit.

Compressor - An electro-mechanical device that adds heats to the refrigerant by compressing it, known as “heat of compression” the resulting increase in refrigerant temperature increases its pressure and causes the refrigerant to circulate through the system.

Evaporator - A finned copper coil mounted on top of the water heater. The refrigerant enters as a liquid, as it passes through the coil it absorbs heat from the surrounding atmosphere and “boils off” (evaporates) to a gas.

Condenser - An insulated housing containing stainless steel chambers where heat transfer occurs. The condenser (or heat exchanger) contains three chambers, one for refrigerant, one for water and a third separating chamber containing air. The refrigerant enters as a gas, as it passes through the condenser it transfers (“gives up”) the heat absorbed via the evaporator to the water flowing through the condenser in a separate chamber, during this process the refrigerant cools and changes state (condenses) back to a liquid.

Receiver Filter Drier - This device, fitted between the condenser and thermal expansion (TX) valve, receives and stores liquid refrigerant from the condenser for delivery to the evaporator. The receiver also incorporates a filter and drier to trap impurities and remove moisture from the sealed refrigeration system

Accumulator - This device, fitted in the suction line prior to the compressor, is designed to accumulate and prevent liquid refrigerant from entering and damaging the compressor. Any liquid refrigerant is evaporated or “boiled off” and converted to a vapour by the accumulator.

Thermal Expansion (TX) Valve - A valve, installed between the condenser and evaporator that controls (meters) the amount of refrigerant delivered to the evaporator. The TX valve has an external temperature sensor fitted to the suction line and increases or decreases the refrigerant flow to the evaporator depending on the detected suction line temperature.

Thermal Cut Out (Overload) - A manual reset temperature sensitive device that automatically cuts off the supply of electrical energy to the control board and/or boost element.

Heating Unit (Element) - A tubular device containing an electric resistance element that converts electrical energy to heat. Standard element ratings are 2.4 and 3.6kW.

Common Faults

When a complaint is lodged about the performance of a hot water system there are a number of causes that should be checked and eliminated. In an attempt to pinpoint the most likely cause it is important to discuss with the customer their reasons for the complaint, the duration of the problem, any change in circumstances or usage and recent weather conditions. This information in conjunction with the following listed common complaints will assist you in locating the most likely cause. All procedures assume there is water flowing through the water heater.

Discoloured water - This may be the result of discoloured water entering from the cold water mains. Check if the cold water is also discoloured.

Excessive hot water usage - The complaints of insufficient hot water and no hot water can on many occasions be attributed to hot water usage exceeding the capacity of the water heater to provide hot water.

When first attending a call of this nature it is essential to establish the probable hot water usage by querying the usage habits of the household and compare this with the potential delivery of the model water heater installed. It can then be established if the usage is within or outside the capacity of the model. The areas to look at for excessive usage are:

1. Automatic washing machines.
2. Showers exceeding 12 litres/minute for mixed water and 5 minutes in duration.
3. Two or more showers operating at the same time.
4. Change of occupancy or number of persons increased.
5. High water pressure area. (Excessive pressure relief valve discharge)
6. Plumbing leaks.
7. Crossed connection.

Water hammer - A water heater will not cause water hammer, however valves associated with the water heater may be the source of the problem i.e. cold-water stopcock, non-return valve or relief valve.

Most water hammer problems are associated with plumbing, hot and cold or appliances i.e. solenoid valves, ballcocks, loose pipes, sharp angles in pipe work, faulty or worn valve parts, loose tap washers or neighbouring equipment.

High water pressure areas will have more complaints of this nature and the use of a pressure-limiting valve (PLV) to reduce the household cold-water pressure will usually solve most problems.

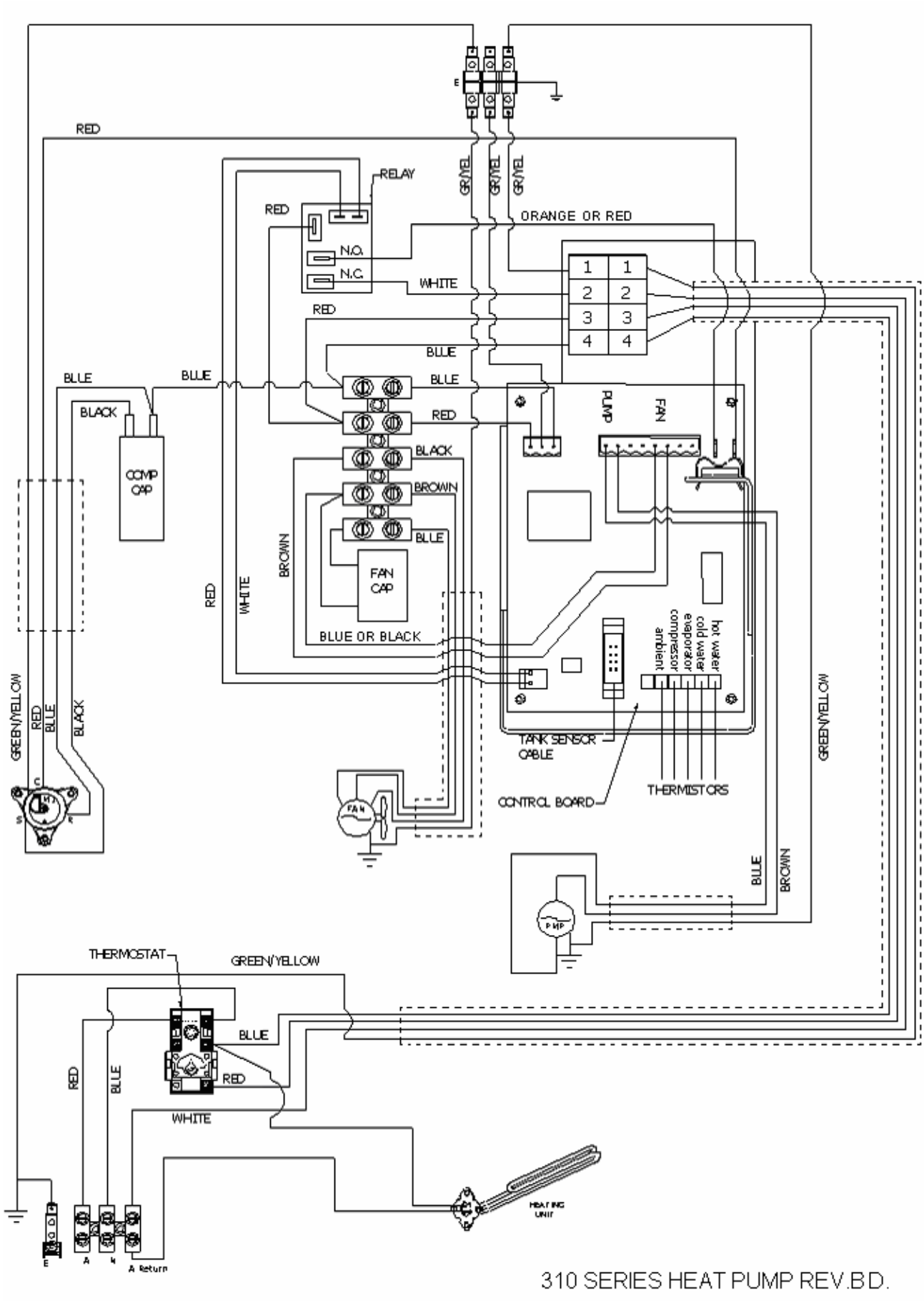
Hot water plumbing leaks - If hot water has not been used for a period of time, feeling the temperature of the hot water line may give an indication of water flow if the pipe is warm. The method of checking for plumbing leaks is:

1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap to ensure the flow of water stops. This will confirm the stopcock is operating correctly.
3. Turn off the hot tap.
4. Turn on the stopcock to make up the water pressure in the cylinder, and then turn the stopcock off again.
5. Wait approximately 5 minutes then do either of the following:
    a. With your ear close to the stopcock turn it on slightly and listen for any water passing. If there are no leaks, water should not pass.
    b. Open a hot tap while listening for any pressure release. If there is a pressure release there will be no leaks in the plumbing system.

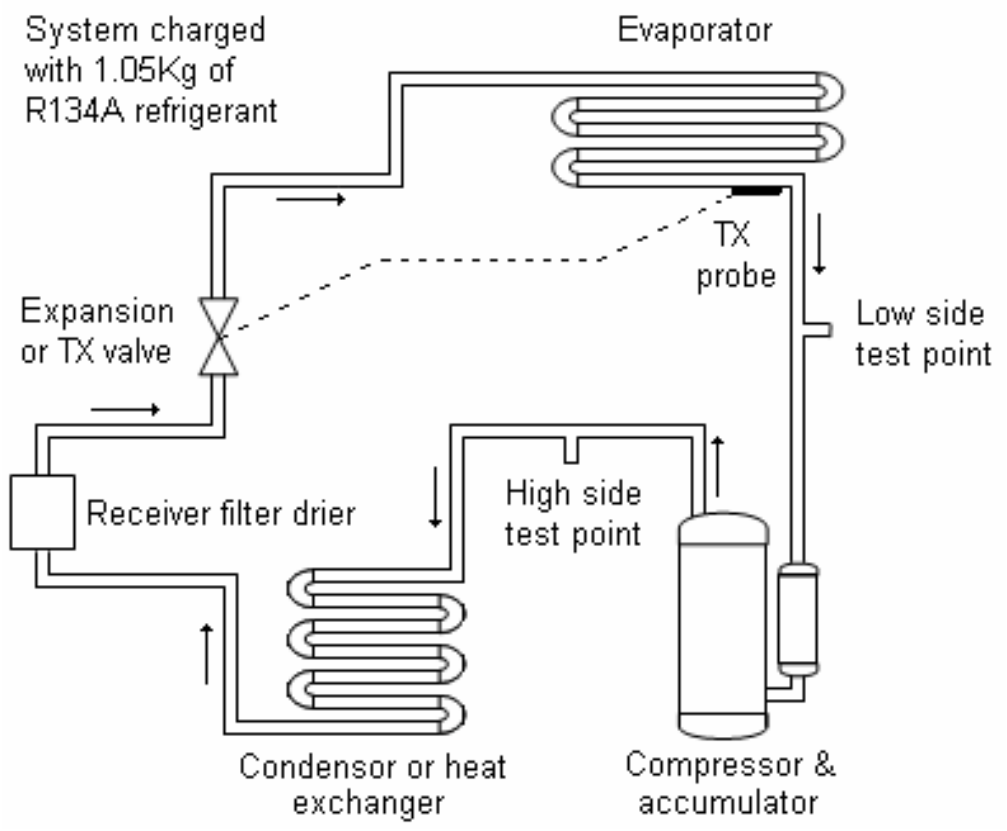
Mixing or crossed connections - If an automatic dishwasher, washing machine, flick mixer tap, tempering valve or thermostatic mixing valve is installed there is always the possibility that the cold water could mix with the hot water through a faulty or incorrectly installed valve. This is referred to as a cross connection. The complaints of insufficient hot water, water too cold or excessive discharge from the pressure relief valve may be attributed to a cross connection. The method of checking for a cross connection is:

1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap. If water flow is persistent and cold a cross connection exists.

Wiring Diagram



Refrigeration Sealed System Diagram



LED Indication

All 310 series Heat Pumps have LED indication. There are two variations of LED indication depending upon the version of the controllers software; however all versions utilise a red and green LED to display the operational status and/or fault condition of the appliance. Note: The software version is printed on a label on the control board.

Controller Software Version HPV 3.1, HPV 3.2 or no HPV identification

310 Series Heat Pumps with controller version HPV3.1, HPV 3.2 or no HPV identification have a green and red LED located internally on the control board in the heat pump (refrigeration) module and utilise the following LED indication:

LED Indication		
LED Status	**Condition**	**Details**
Green Solid	S4 > 53ºC or S5 > 50ºC	Standby mode (end of heating cycle, cylinder water at required temperature).
Green Flashing	S4 < 44.5ºC or S3 < 50ºC	Call for heat initiated.
Red Flashing	Various (refer to operating sequence flow chart on page 6 for more details).	Component fault or ambient conditions too cold for heat pump operation.
No indication	Fault or system operating in limp mode.	Fault or system in limp mode with call for heat satisfied (water in cylinder @ 70ºC determined by mechanical thermostat).

Note: Refer to diagram on page 5 for control board LED location.

Controller Software Version HPV 4.0 or higher

310 series Heat Pumps with controller version HPV 4.0 or higher have a red and green LED located externally on the front of the heat pump module or internally on the control board in the heat pump (refrigeration) module depending upon date of manufacture.

LED Flashing Frequency: Different combinations of flashing red and/or green LED's are utilised to indicate the operational status or fault condition of the Heat Pump. Each flash in a series will last 0.5 seconds and is separated by 0.5 seconds between flashes. Each series of flashes is separated by 2 sec.

Example: LED provides 2 flashes:
1) LED on for 0.5 sec.
2) LED off for 0.5 sec.
3) LED on for 0.5 sec.
4) LED off for 2 sec.
5) Return to Step 1).

Operational LED Indication: If no fault is present the green LED will flash as shown below to indicate the operational sequence number the Heat Pump is currently operating in (refer to operating sequence flow chart on page 6 for more details).

Operational LED Indication		
Sequence	**Green LED**	**Red LED**
0	Solid	0
2	2 flashes	0
3	3 flashes	0
4	4 flashes	0

Fault Indication: If a fault is present the green and/or red LED's will indicate the fault condition according to the table below.

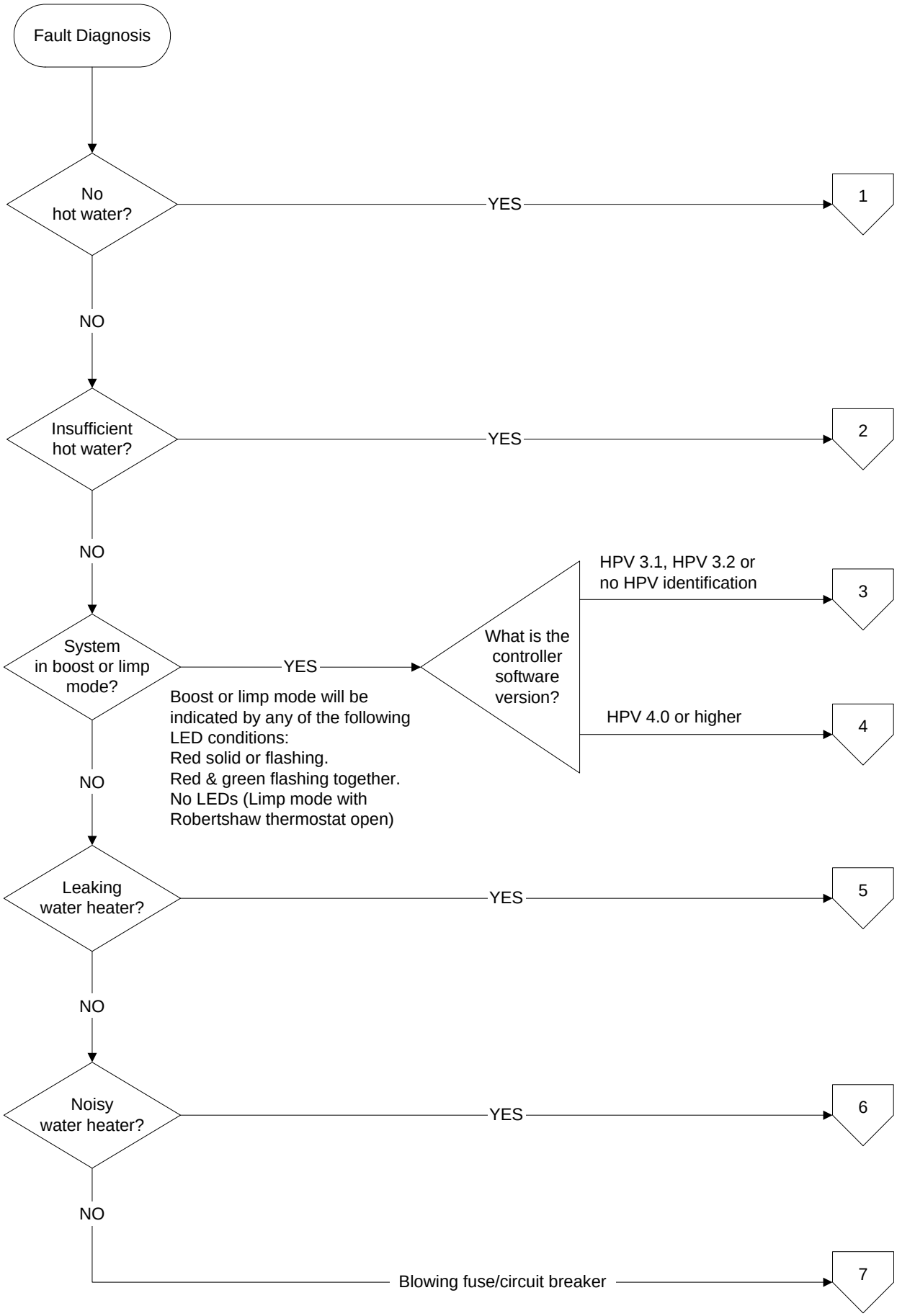
Fault Indication			
Fault	**Error**	**Green LED**	**Red LED**
Faulty power supply or system in limp mode with call for heat satisfied (1)	N/A	0	0
T3 (comp dis) > 60°C in sequence 0 (2)	SerrNo 4	1 Flash	0
T4 (ambient air) < 0°C (3)	SerrNo 1	0	Solid
Any Sensor Strip Sensor Fault	Any Sflag	0	1 Flash
Water circ fault T0 (water outlet) > 80°C	SerrNo 2	0	2 Flashes
T2 (evaporator) < -3°C	SerrNo 8	0	3 Flashes
Comp/refrig fault T3 > T4 + 15°C (in seq3)	SerrNo 32	0	4 Flashes
Comp/refrig fault T0 - T1 < 8°C (in seq4)	SerrNo 32	0	5 Flashes
Water circ fault T1 > S4 + 7°C	SerrNo 64	0	6 Flashes
TRIAC/refrig fault T3 > 110°C	SerrNo 128	0	7 Flashes
Thermistor T0 Fault	Tflag 1	1 Flash*	1 Flash*
Thermistor T1 Fault	Tflag 2	2 Flashes*	2 Flashes*
Thermistor T2 Fault	Tflag 4	3 Flashes*	3 Flashes*
Thermistor T3 Fault	Tflag 8	4 Flashes*	4 Flashes*
Thermistor T4 Fault	Tflag 16	5 Flashes*	5 Flashes*

Notes:
* The green and red LED's flash simultaneously in these cases.
(1) System may be in limp mode with call for heat satisfied (water in cylinder @ 70ºC determined by mechanical thermostat).
(2) This condition creates a delay start for the compressor. This is not considered a fault.
(3) Ambient temperature too cold for heat pump operation. This is not considered a fault.

Fault Finding

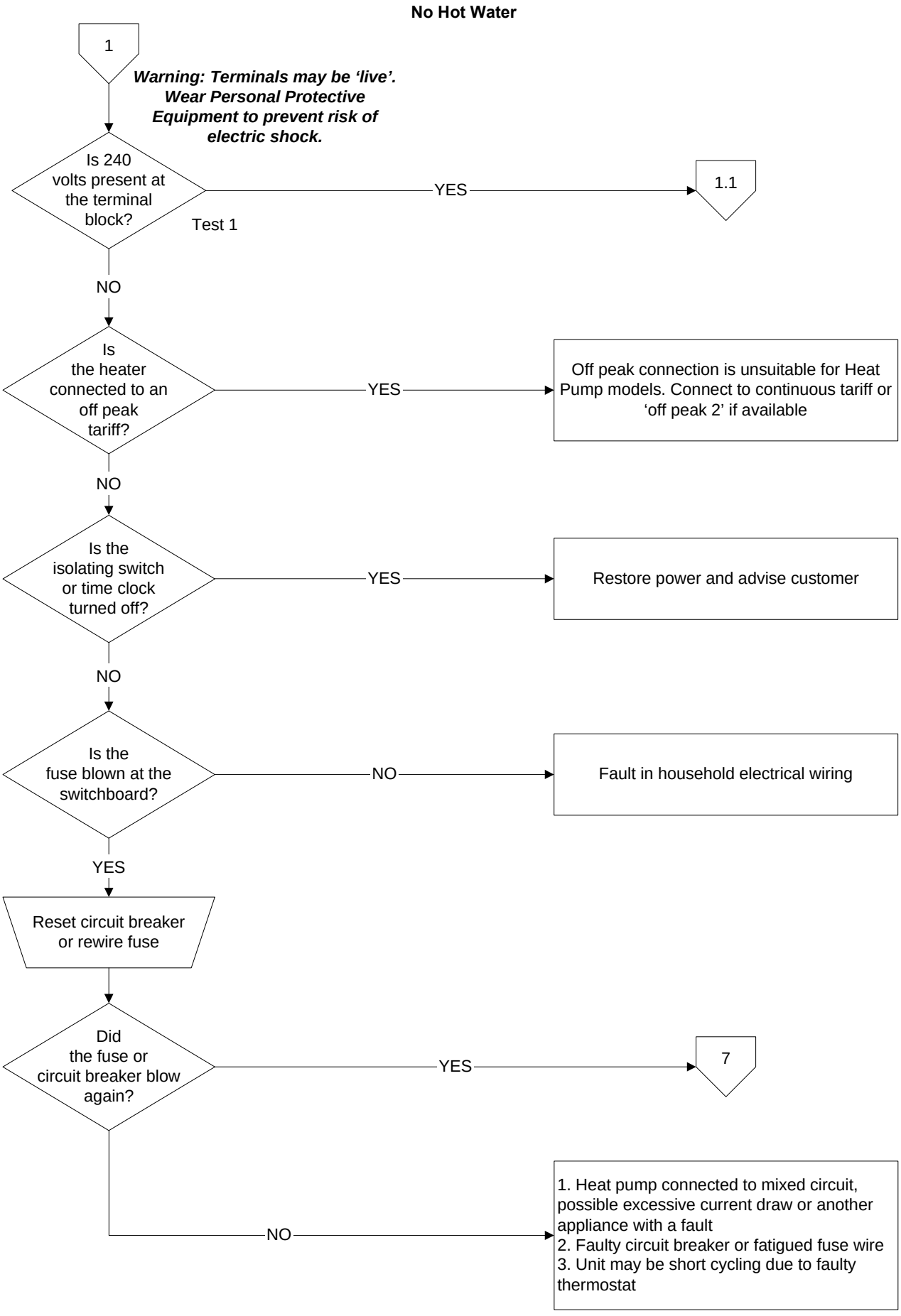
Fault		Chart Number	Page
No Hot Water		1	16
		1.1	17
		1.2	21
		7	43
Insufficient hot water		2	23
System in boost or limp mode	Software version HPV 3.1, HPV 3.2 or no HPV identification	3	24
		3.1	25
		3.2	25
		3.3	26
		3.4	27
		3.5	29
		3.6	30
		3.7	30
		8.1	44
		8.3	44
	Software version HPV 4.0 or higher	4	32
		4.1	33
		4.2	33
		4.3	34
		4.4	35
		4.5	36
		4.6	37
		4.7	38
		4.8	39
		4.9 – 4.13	40
		4.14	40
		8	44
		8.2	44
Leaking water heater		5	41
Noisy water heater		6	42
Blowing fuse/circuit breaker		7	43

General Fault Finding Chart

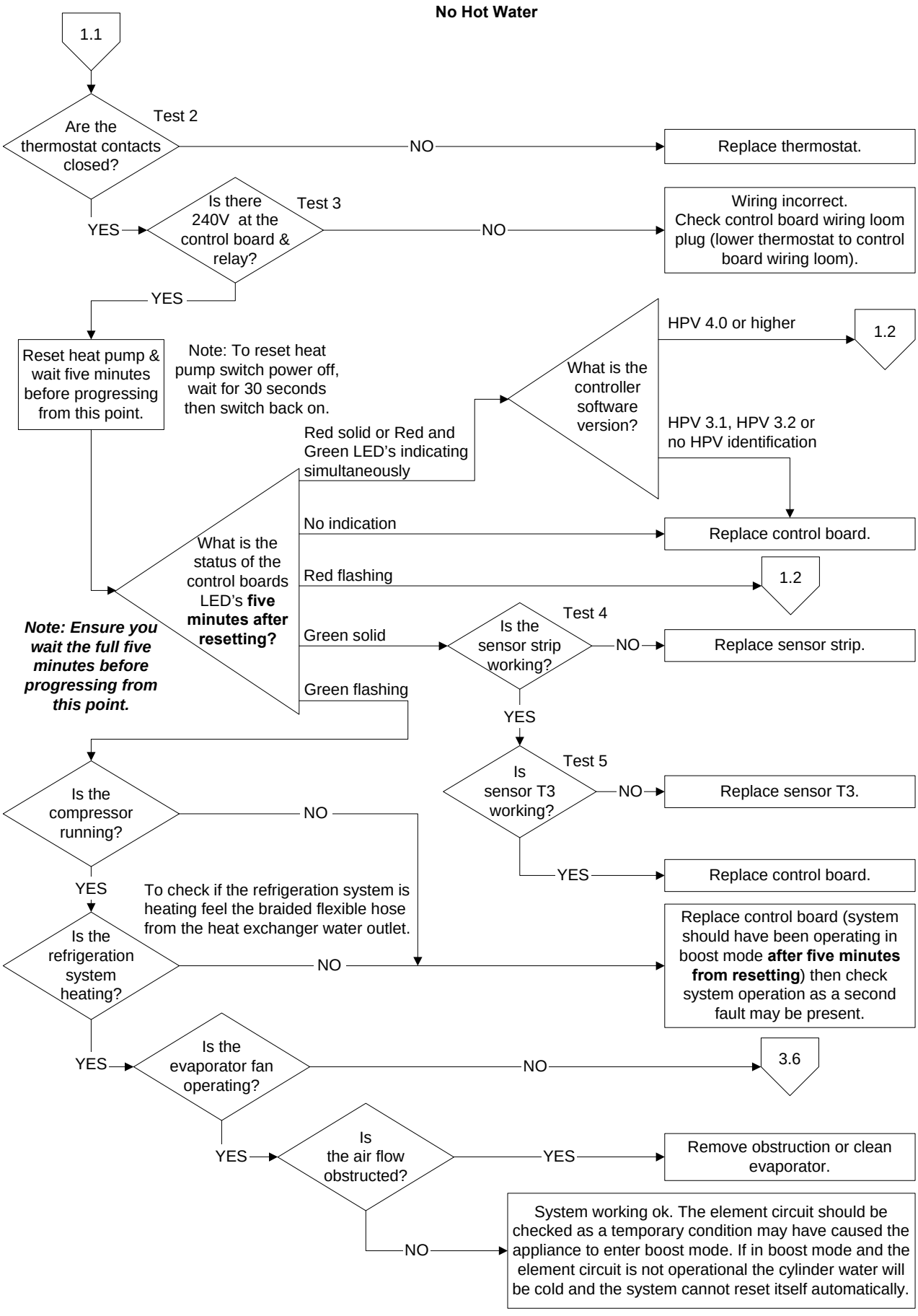


Note: For more information on LED indication refer to pages 12 and 13.

Fault Finding Chart 1



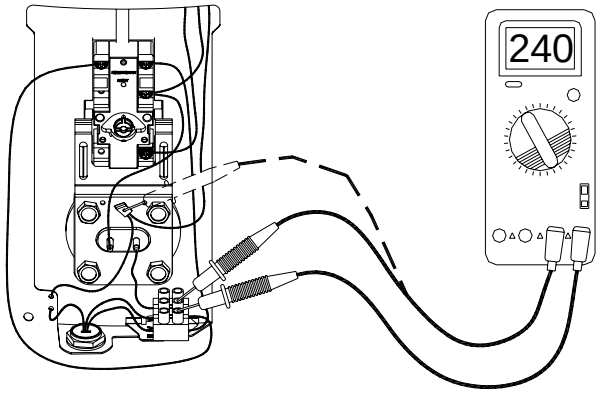
Fault Finding Chart 1.1



Note: For more information on LED indication refer to pages 12 and13.

Component Tests 1, 2, 3 & 6

Tests 1

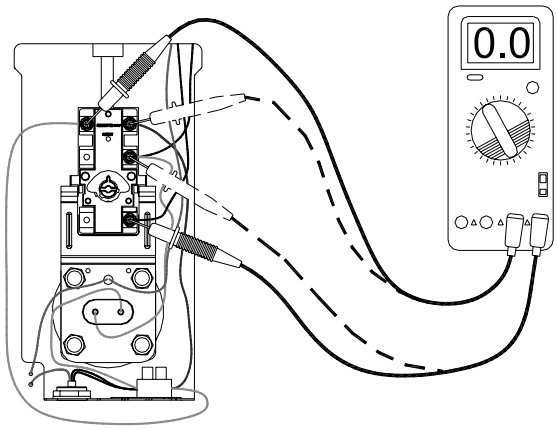


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the AC voltage scale, measure between the terminals of the terminal block located behind the element access cover. The following measurements should be obtained:

Active & Neutral – 240 volts.
Active & Earth – 240 volts.
Neutral & Earth – 0 volts.

Test 2

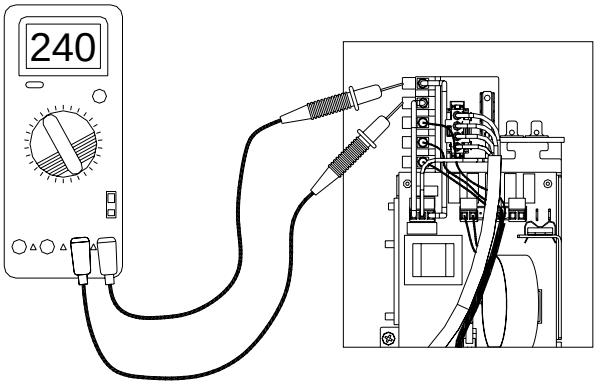


Warning - Ensure power is isolated before conducting this test.

Using a multimeter on the ohms scale, measure between the terminals of the mechanical thermostat. The following results should be obtained:

1L & 2T – 0 ohms.
3L & 4L – 0 ohms.

Test 3

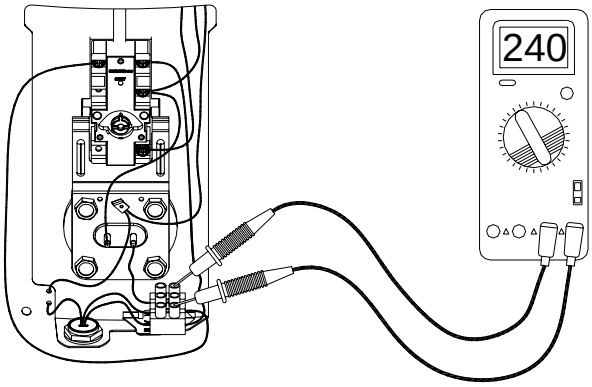


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the AC voltage scale, measure between the top 2 terminals of the heat pump module terminal block.

Normal voltage is 240 volts.

Test 6



Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the AC voltage scale, measure between the A return and Neutral terminals of the terminal block located behind the element access cover.

Normal voltage is 240 volts.

Note: Refer to page 19 for component test 4 and page 20 for component test 5.

Component Test 4

Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Sensor Strip Testing: Unplug the sensor strip plug from the control board and using a multimeter on the kilo-ohms scale, measure between the pins of the sensor strip plug*. There are six individual tests to be performed as there are six individual sensors contained along the length of the sensor strip (sensors S0 – S5). As the resistance of each sensor will change according to its temperature, the resistance measurements for each sensor will need to be checked against the Temperature/Resistance Table shown below. For this reason it is best to empty the tank of hot water and then measure the cold water temperature at the T&PR so a known temperature datum can then be applied to all sensors which should then in turn all have similar resistance value when tested.

Sensor Test Points

S0 – Between Pins 1 and 9

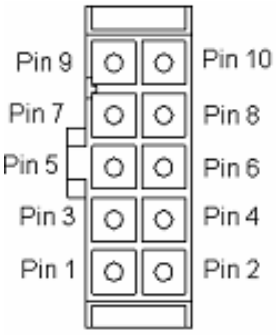
S1 – Between Pins 2 and 9

S2 – Between Pins 4 and 9

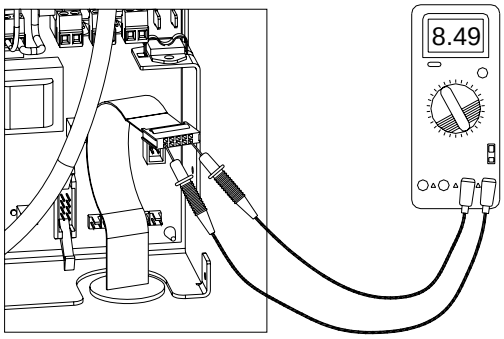
S3 – Between Pins 6 and 9

S4 – Between Pins 3 and 8

S5 – Between Pins 3 and 10



Sensor strip plug pin configuration



Testing the sensor strip

*Note: The sensor strip plug socket test points are quite small, Fine Probe Adapters (part number WH0020082) can be utilised as probe extensions. Alternatively small pins may be used however ensure good contact is made when testing.

Sensor Strip Temperature / Resistance Table

T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)
-10	37.45	10	15.45	30	7.037	50	3.485	70	1.853
-9	35.73	11	14.82	31	6.782	51	3.371	71	1.799
-8	34.11	12	14.22	32	6.537	52	3.262	72	1.743
-7	32.56	13	13.65	33	6.302	53	3.157	73	1.695
-6	31.10	14	13.10	34	6.076	54	3.055	74	1.646
-5	29.71	15	12.58	35	5.86	55	2.957	75	1.589
-4	28.39	16	12.09	36	5.653	56	2.863	76	1.552
-3	27.13	17	11.61	37	5.454	57	2.773	77	1.508
-2	25.94	18	11.16	38	5.264	58	2.686	78	1.465
-1	24.81	19	10.72	39	5.081	59	2.602	79	1.424
0	23.73	20	10.31	40	4.905	60	2.521	80	1.384
1	22.71	21	9.913	41	4.736	61	2.442	81	1.345
2	21.73	22	9.535	42	4.574	62	2.367	82	1.307
3	20.81	23	9.173	43	4.418	63	2.295	83	1.271
4	19.92	24	8.826	44	4.269	64	2.225	84	1.236
5	19.09	25	8.495	45	4.125	65	2.157	85	1.202
6	18.29	26	8.177	46	3.987	66	2.092	86	1.169
7	17.52	27	7.873	47	3.854	67	2.029	87	1.137
8	16.80	28	7.583	48	3.726	68	1.968	88	1.107
9	16.11	29	7.304	49	3.603	69	1.91	89	1.077

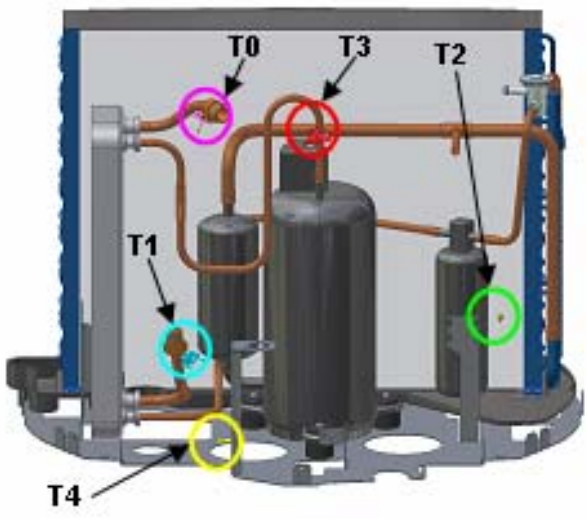
Component test 5

T Sensor Testing: 310 Series Heat Pumps have five independent thermistors which are utilised to monitor temperatures at various locations around the system. These thermistors connect to and are monitored by the control board and are known as 'T sensors'.

All five T sensors are identical and each can be tested as follows:

Warning - Ensure power is isolated before conducting this test.

Unplug the relevant T sensor from the control board and remove the T sensor from its location so its temperature will be the same as the ambient air temperature (As sensor T4 detects the ambient air temperature it may remain in position for this test). Using a multimeter on the kilo-ohms scale, measure between the two pins of the T sensor plug*. As the resistance of each sensor will change according to its temperature, the resistance measurements for each sensor will need to be checked against the Temperature/Resistance Table shown below and the value then compared to the ambient air temperature.



*Note: The sensor strip plug socket test points are quite small, Fine Probe Adapters (part number WH0020082) can be utilised as probe extensions. Alternatively small pins may be used however ensure good contact is made when testing.

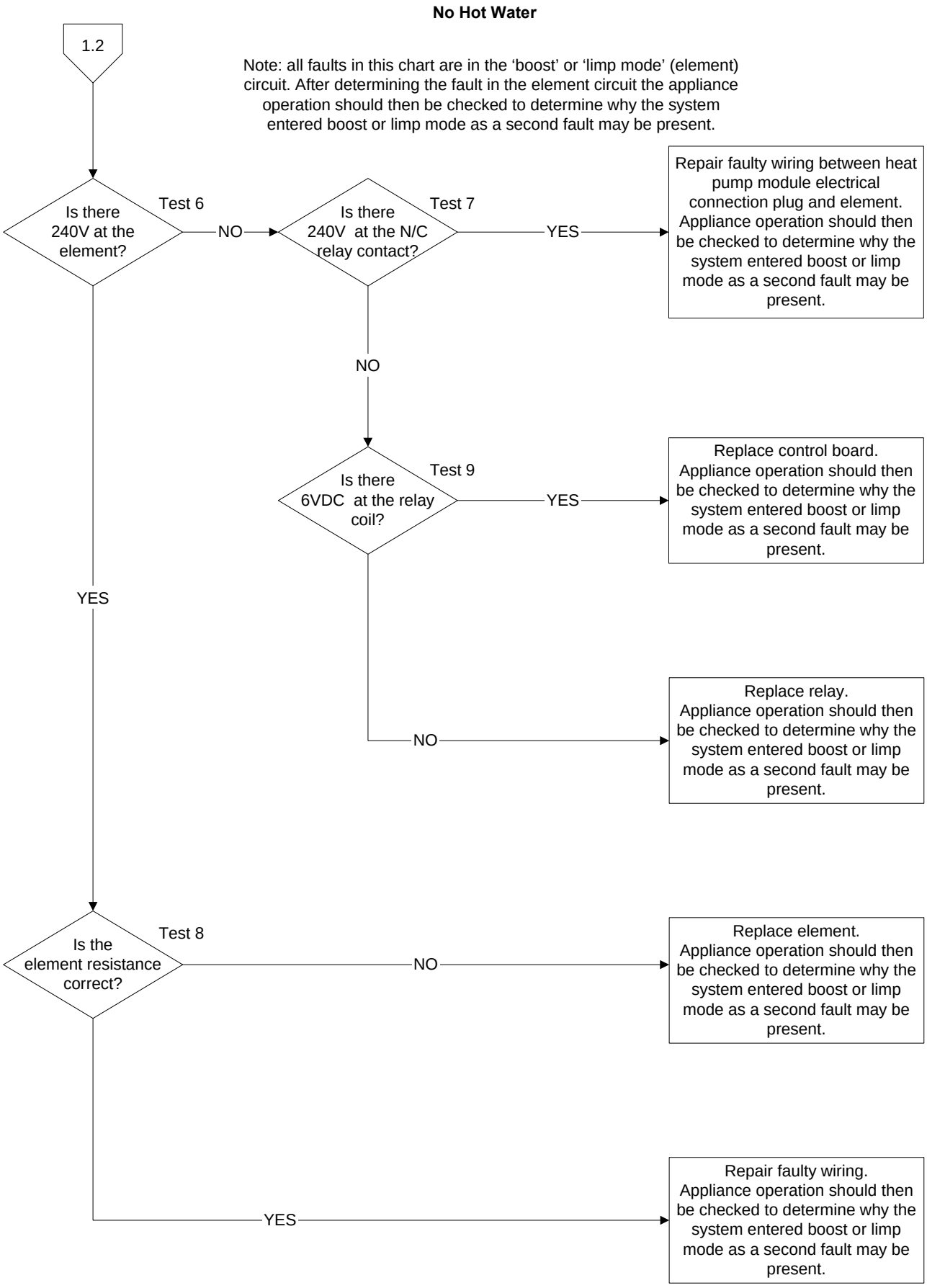
Sensor	Monitors	Part Number
T0	Water temperature leaving the condenser	056006
T1	Water temperature entering the condenser	
T2	Evaporator temperature	
T3	Compressor discharge temperature	
T4	Ambient air temperature	

T Sensor Temperature / Resistance Table

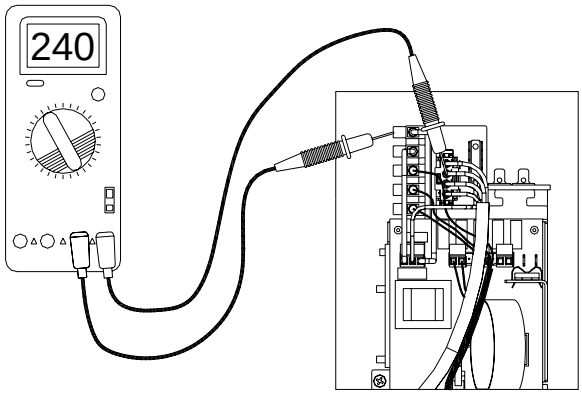
The table below sets out the resistance of the T sensors for a given water or air temperature.

Temperature Degrees C	Resistance (All T Sensors) Kilo-ohms
0	23.73
10	15.45
20	10.31
30	7.037
40	4.905
50	3.485
60	2.521
70	1.853
80	1.384

Fault Finding - Chart 1.2



Tests 7

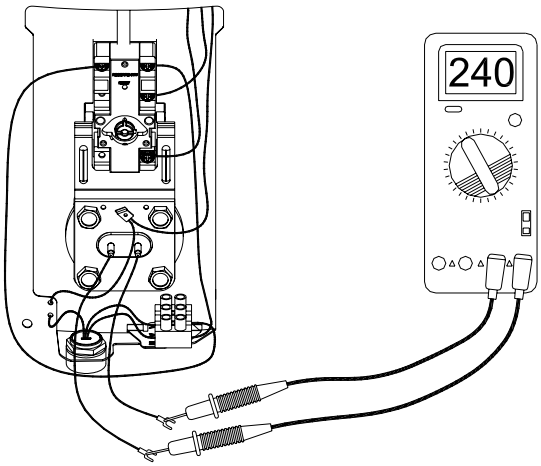


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the AC voltage scale, measure between the white wire on the heat pump module electrical connection plug and the top terminal of the heat pump module terminal block (Neutral).

Normal voltage is 240 volts.

Test 8

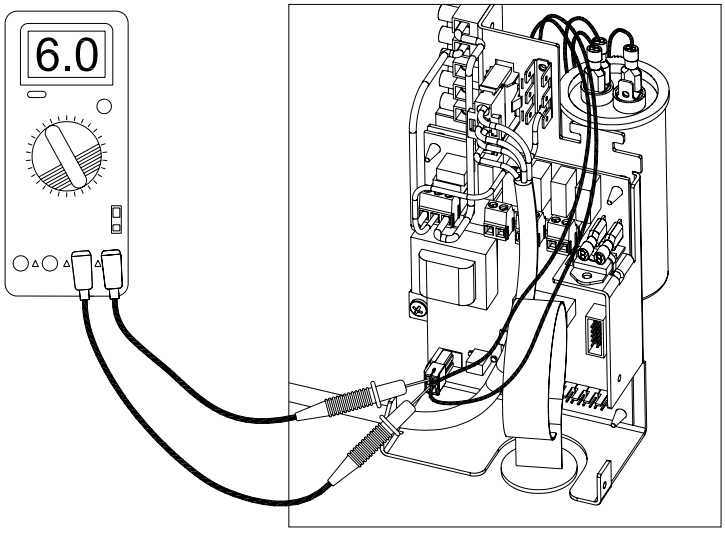


Warning - Ensure power is isolated before conducting this test.

Disconnect the element wires from the thermostat and terminal block, and using a multimeter on the ohms scale, measure between the two element wires. The following results should be obtained:

2.4kW element: 22 – 26 ohms.
3.6kW element: 15 – 17 ohms.

Test 9

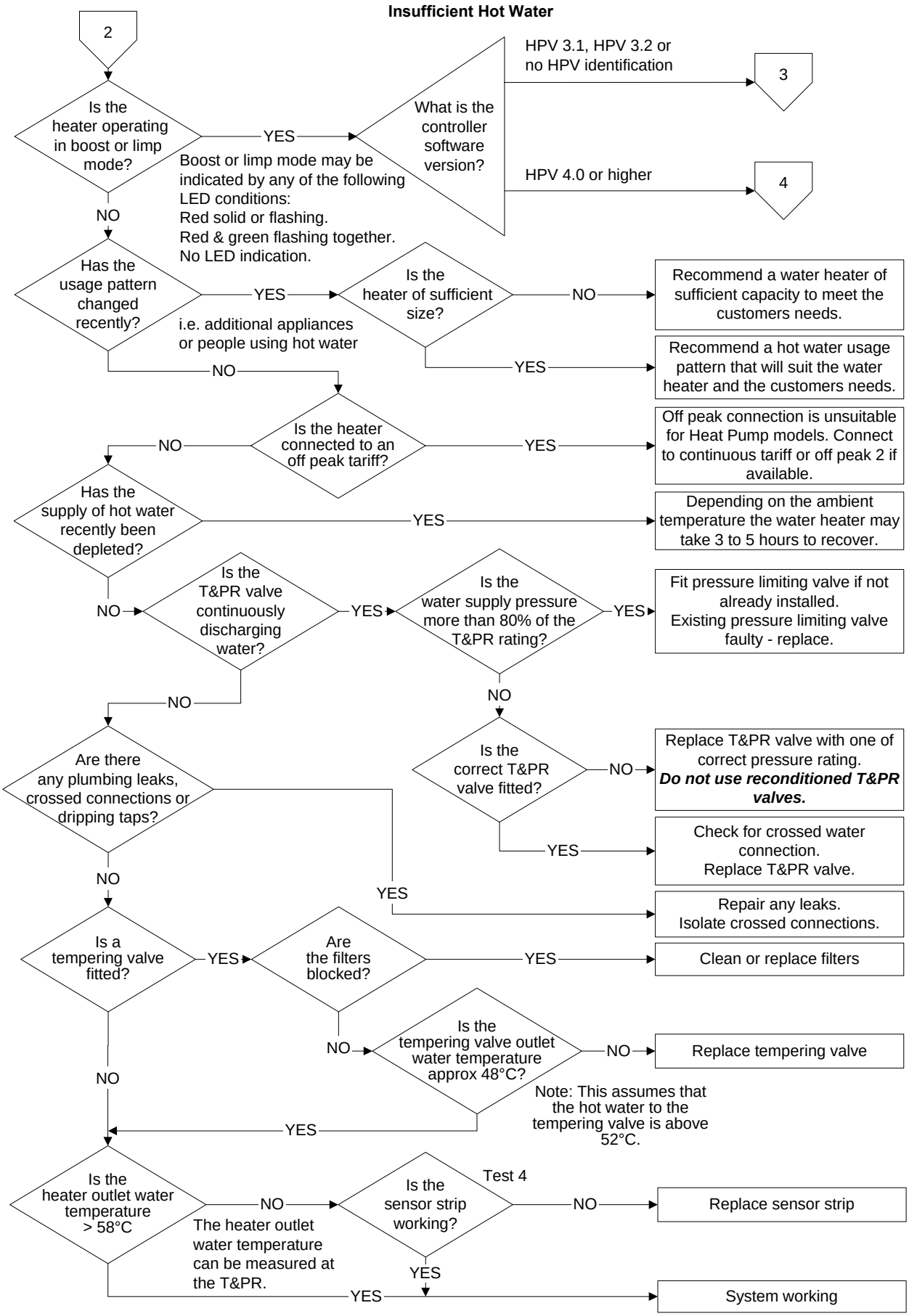


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the DC voltage scale, measure between the two wires on the control board relay plug.

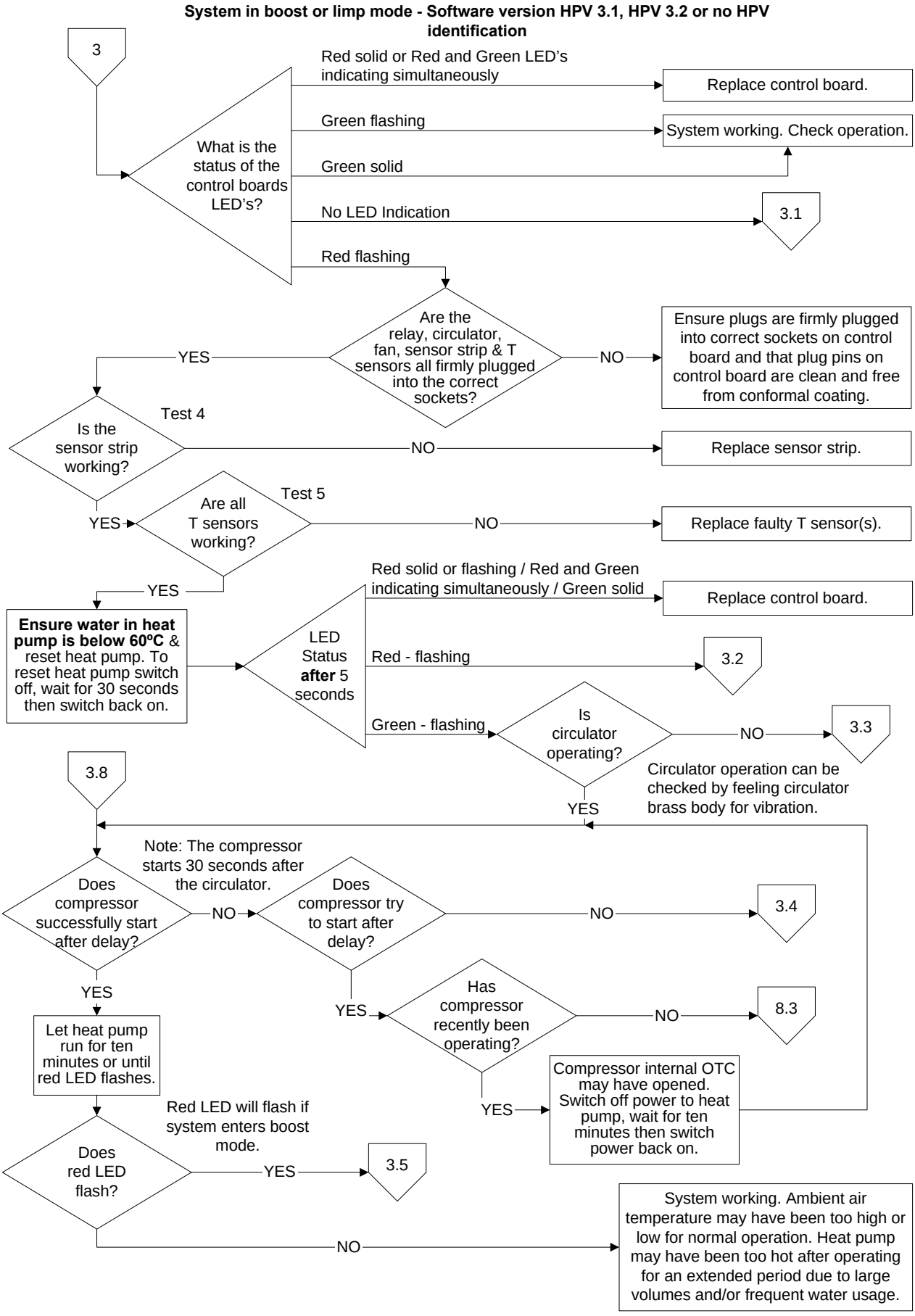
Normal voltage is 6 Volts DC.

Fault Finding - Chart 2



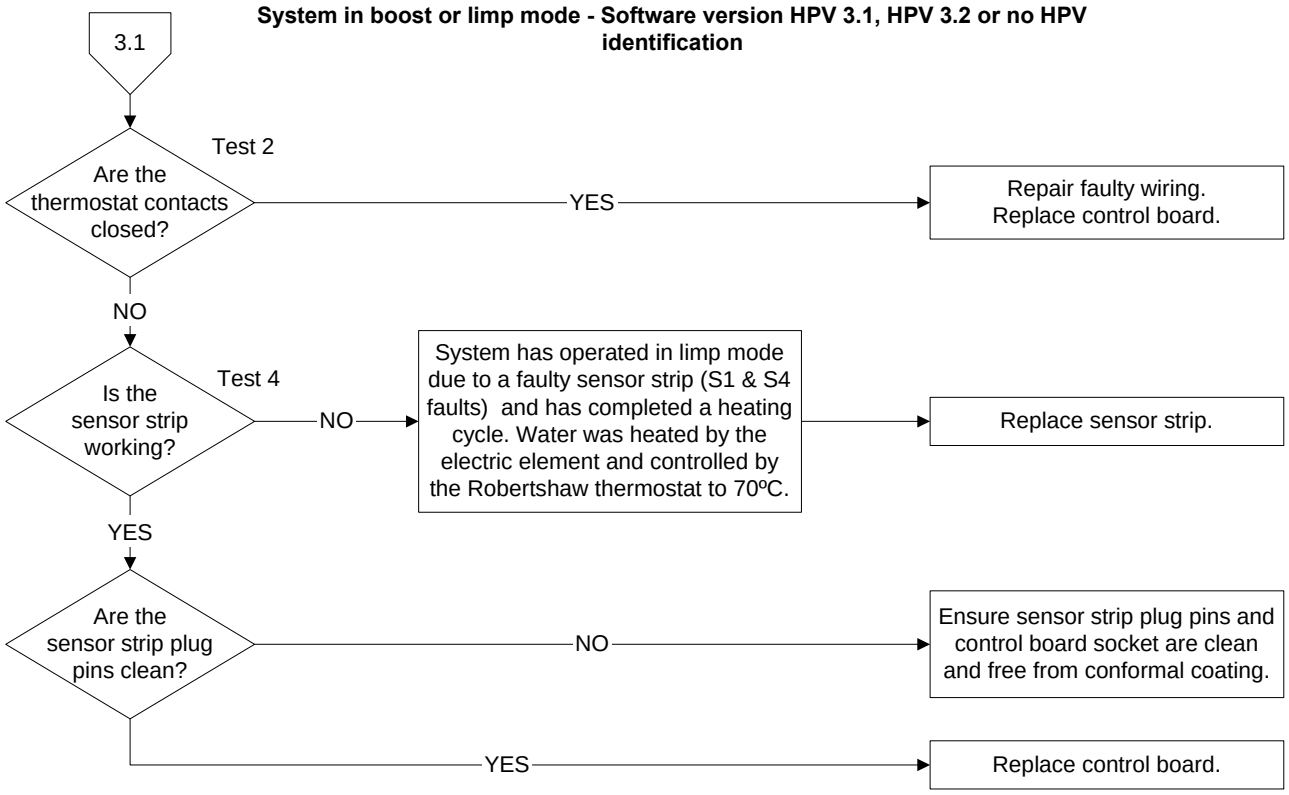
Note: For more information on LED indication refer to pages 12 and 13.

Fault Finding - Chart 3

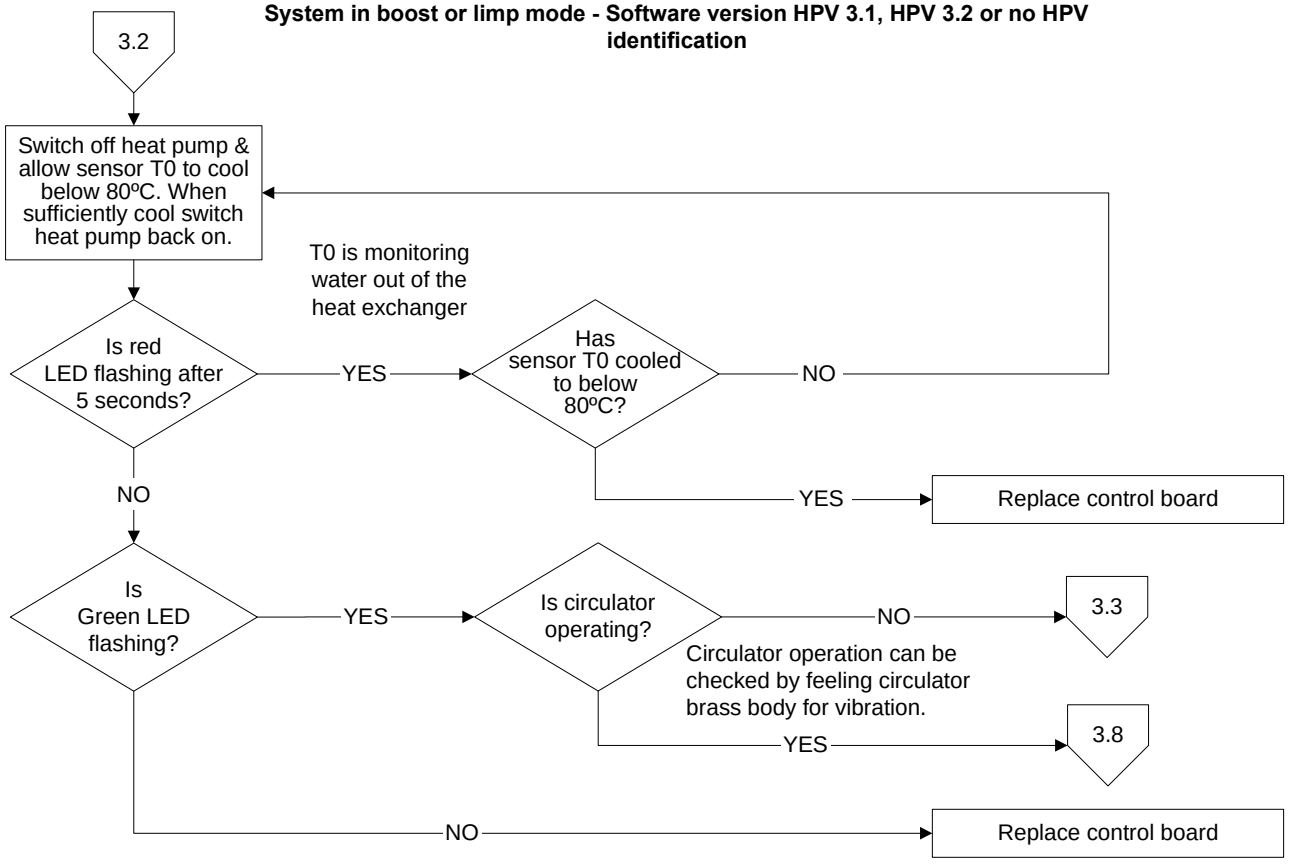


Note: Refer to page 5 for T sensor plug socket location on control board.

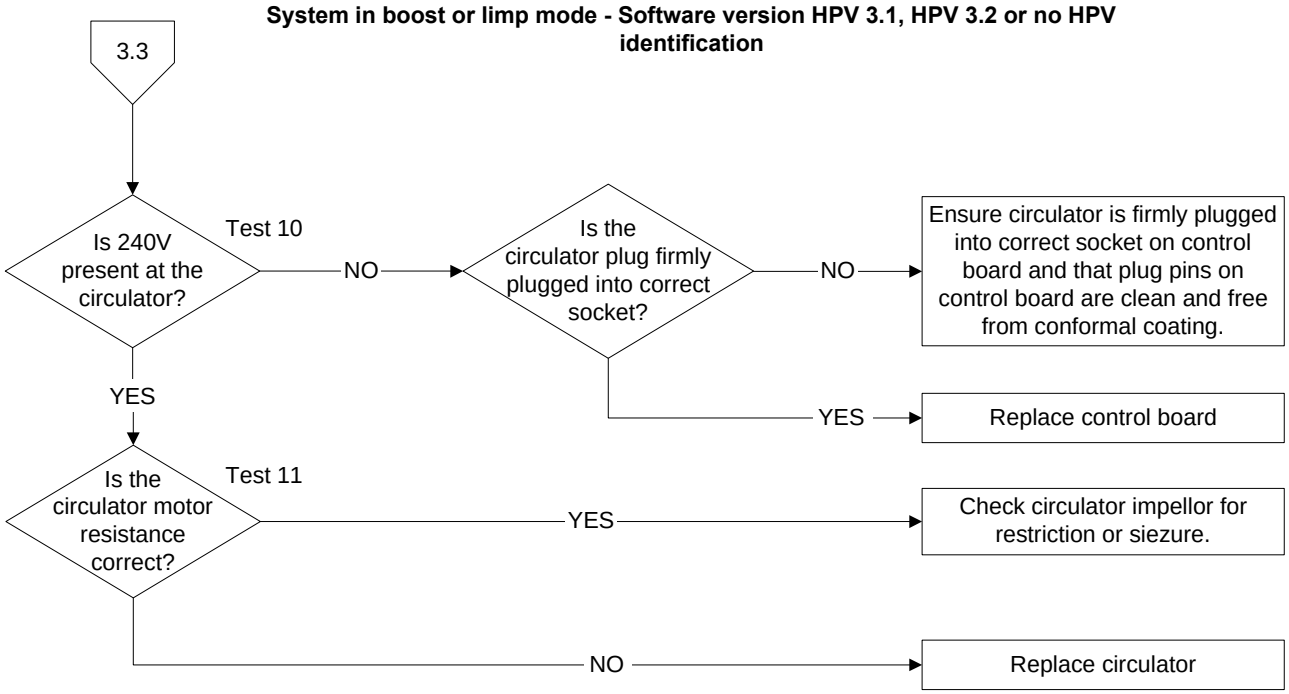
Fault Finding – Chart 3.1



Fault Finding – Chart 3.2

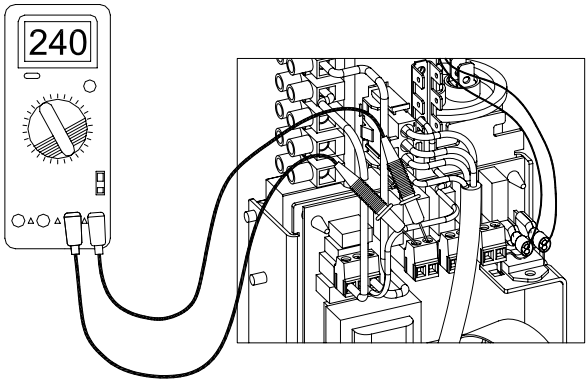


Fault Finding – Chart 3.3



Component Tests 10 & 11

Test 10



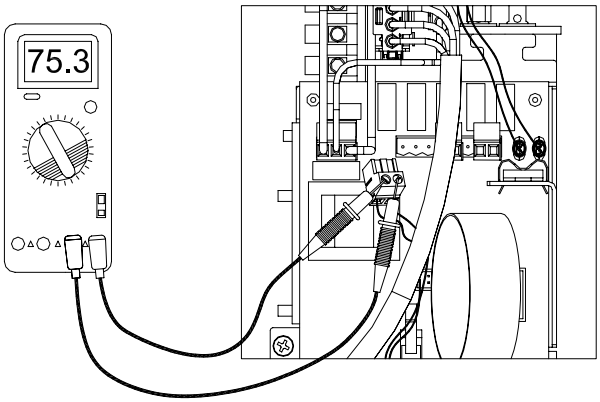
Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the AC voltage scale, measure between the circulator plug terminals at the control board.

Normal voltage is 240 volts.

Note: As the control board controls the speed of the circulator by pulsing the electrical supply to the circulator an analogue multimeter may indicate between 180 – 240V.

Test 11

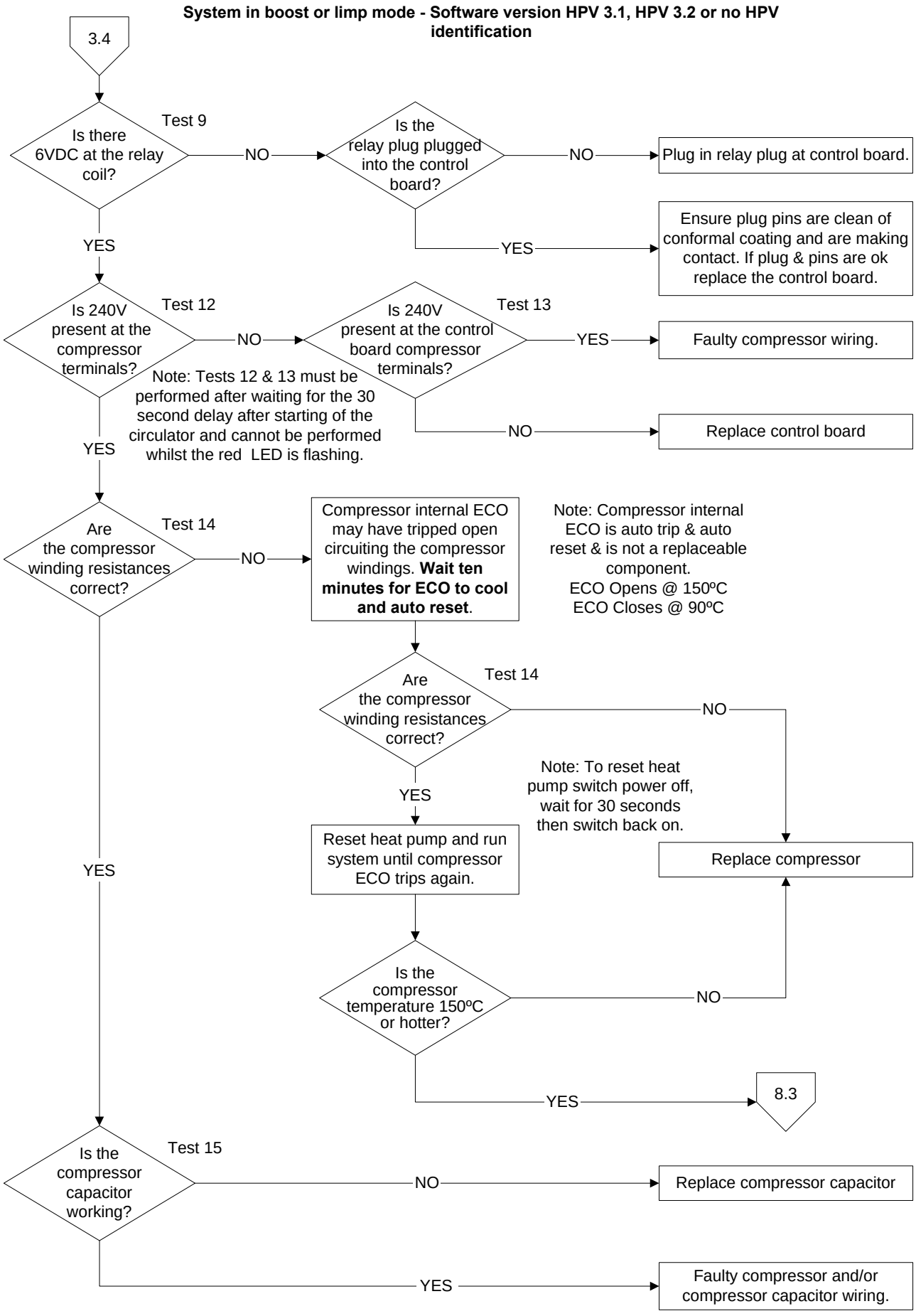


Warning - Ensure power is isolated before conducting this test.

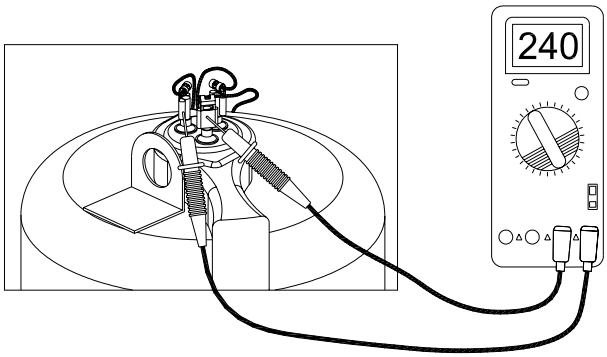
Unplug the circulator connection plug from the control board and using a multimeter on the ohms scale, measure between the two circulator connection plug terminals.

A reading of approximately 75.3 ohms should be obtained.

Fault Finding – Chart 3.4



Tests 12

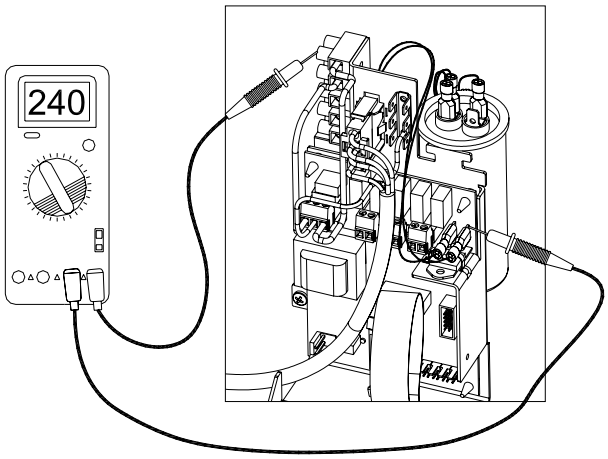


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Remove the compressor electrical access cover and using a multimeter on the AC voltage scale, measure between the red and blue wires.

Normal voltage is 240 volts.

Test 13

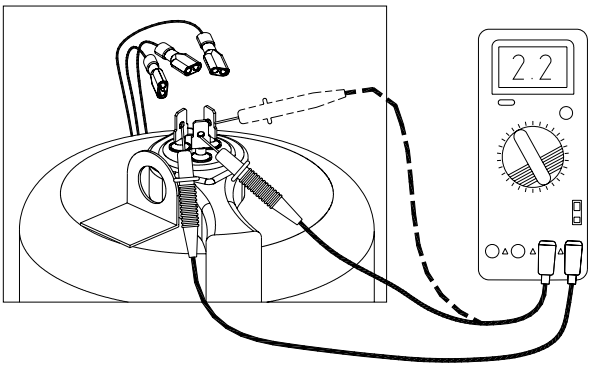


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the AC voltage scale, measure between the control board compressor output terminal and the top terminal of the heat pump module terminal block (Neutral).

Normal voltage is 240 volts.

Test 14

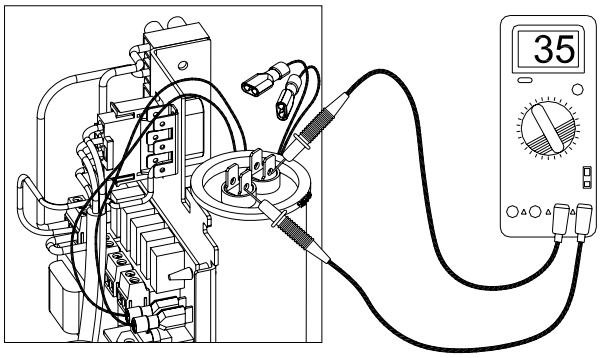


Warning - Ensure power is isolated before conducting this test.

Remove the compressor electrical access cover and mark and disconnect terminal wiring. Using a multimeter on the ohms scale, measure between the compressor terminals. The following run and start winding results should be obtained.

(Run) Red & Blue terminals – 2.2 ohms
(Start) Red & Black terminals – 3.2 ohms

Test 15

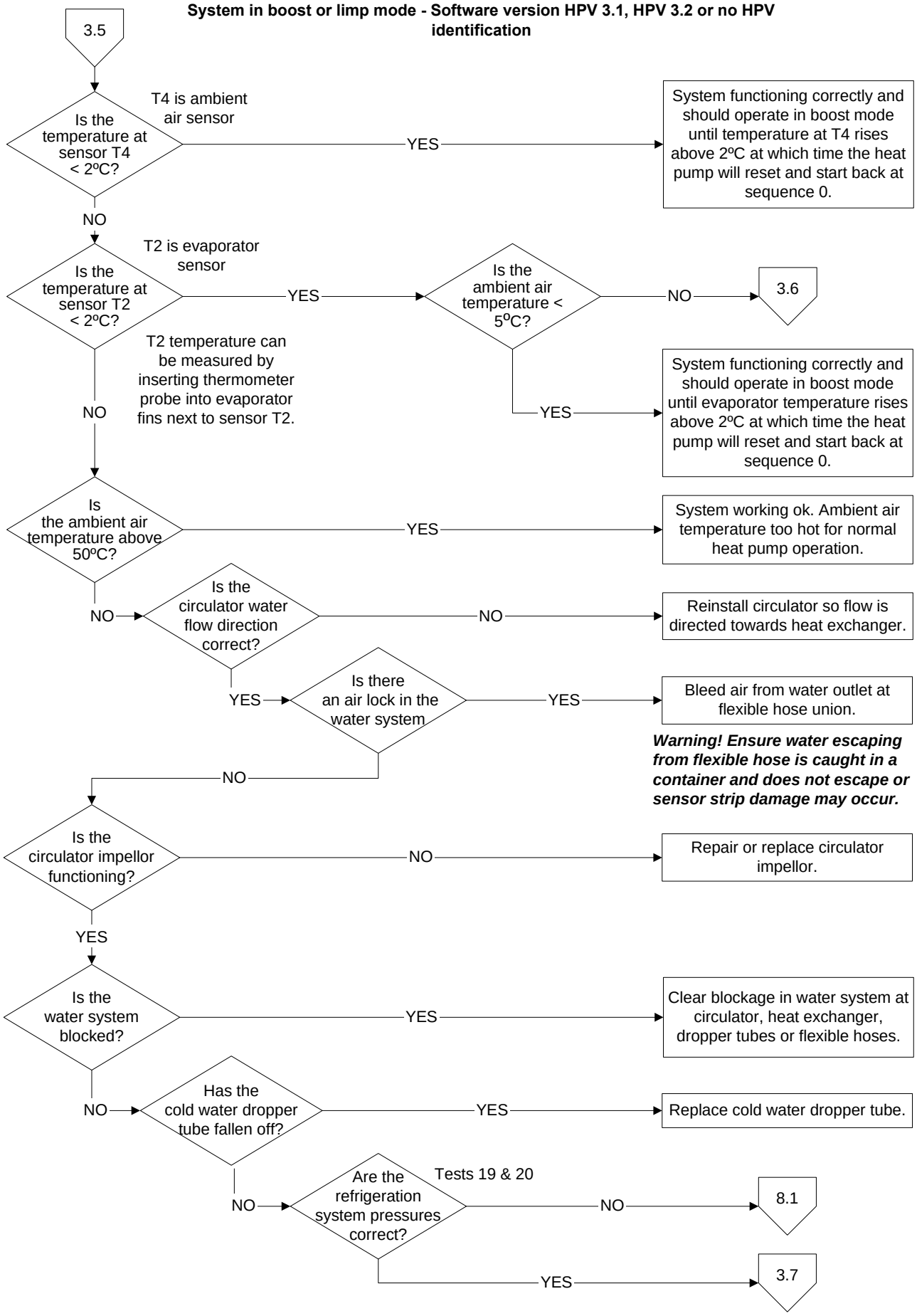


Warning - Ensure power is isolated before conducting this test.

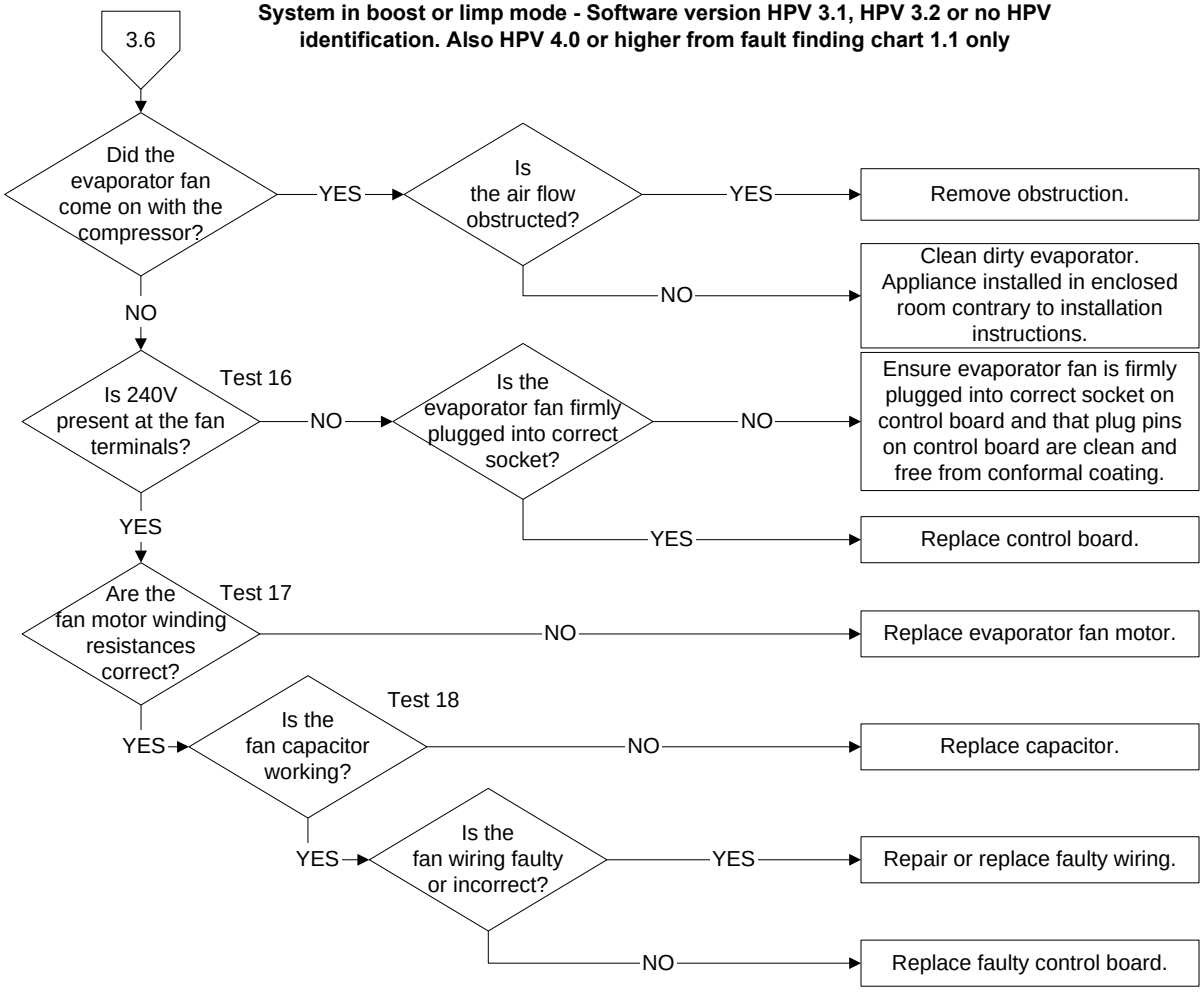
Disconnect the wiring to the compressor capacitor and using a multimeter on the capacitance (µF) scale measure between the two capacitor terminals.

Normal capacitance is 35 micro Farads (35µF).

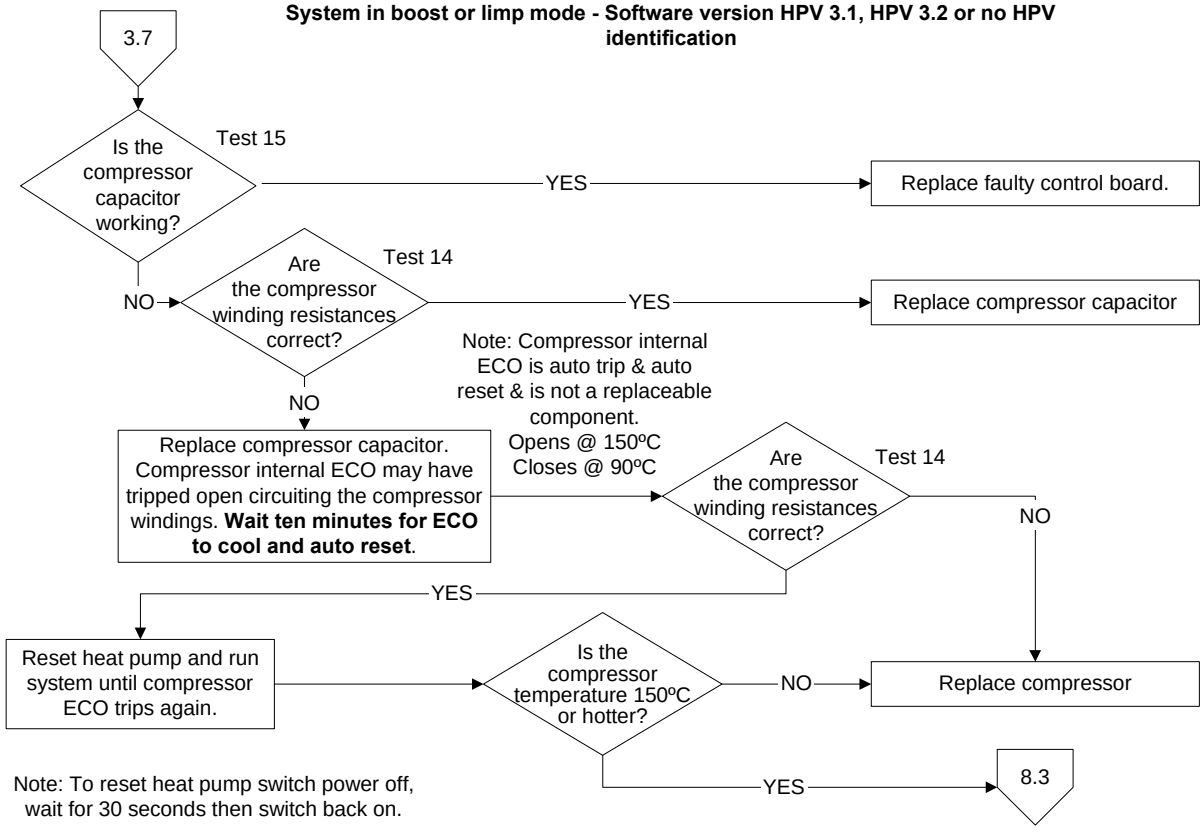
Fault Finding – Chart 3.5



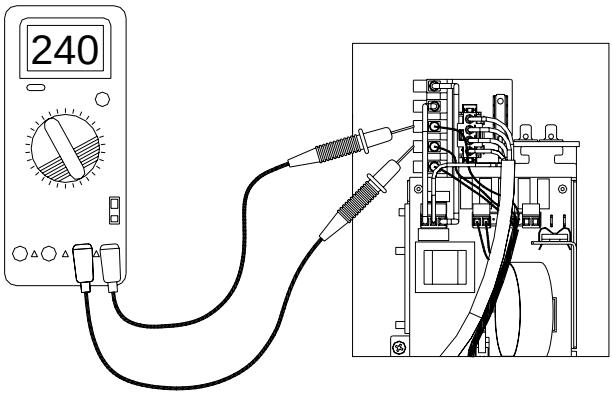
Fault Finding – Chart 3.6



Fault Finding – Chart 3.7



Tests 16

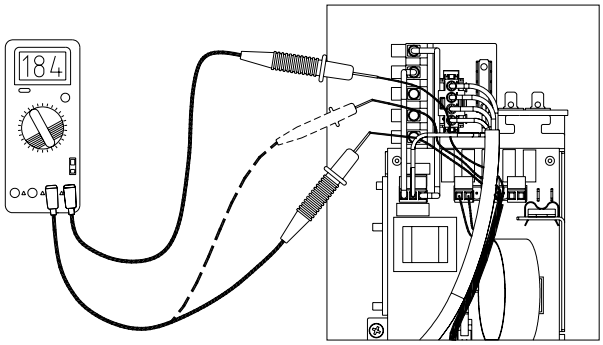


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the AC voltage scale, measure between the third and fourth terminals down from the top on the heat pump module terminal block.

Normal voltage is 240 volts.

Test 17

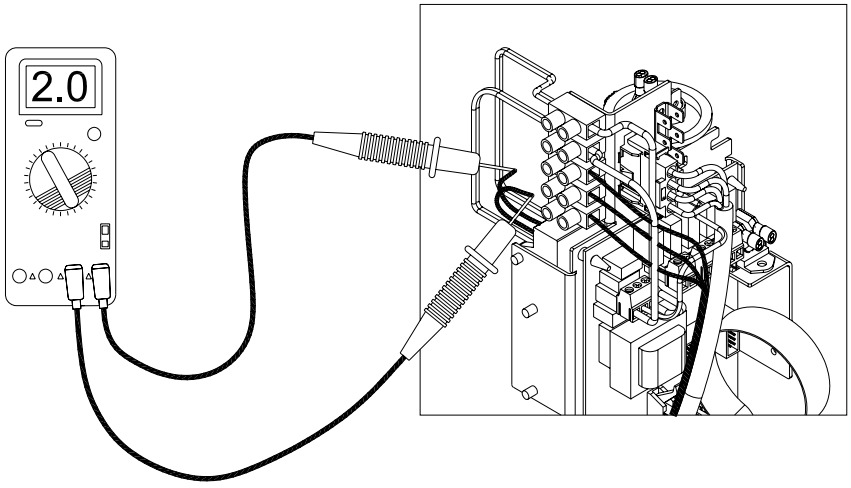


Warning - Ensure power is isolated before conducting this test.

Mark and disconnect fan wiring at the heat pump module terminal block and using a multimeter on ohms scale, measure between the disconnected fan wires. The following run and start winding results should be obtained.

(Run) Black & Brown wires – 184 ohms
(Start) Black & Blue wires – 238 ohms

Test 18



Warning - Ensure power is isolated before conducting this test.

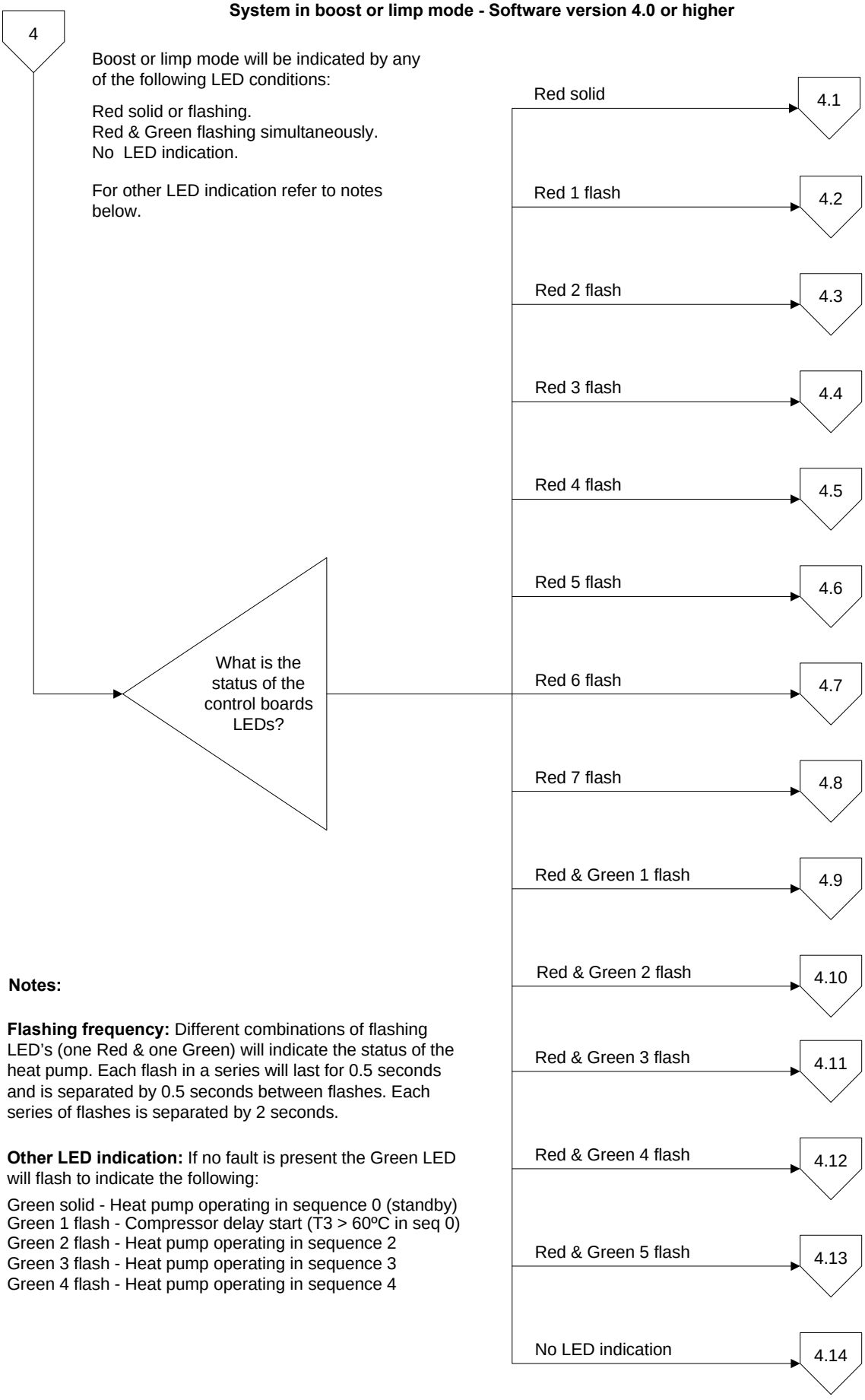
Mark and disconnect the fan capacitor wiring at the heap pump module terminal block and using a multimeter on the capacitance (µF) scale measure between the two capacitor wires.

Normal capacitance is 2 micro Farads (2µF).

Note: Refer to page 45 for component tests 19 & 20.

Fault Finding – Chart 4

System in boost or limp mode - Software version 4.0 or higher



Notes:

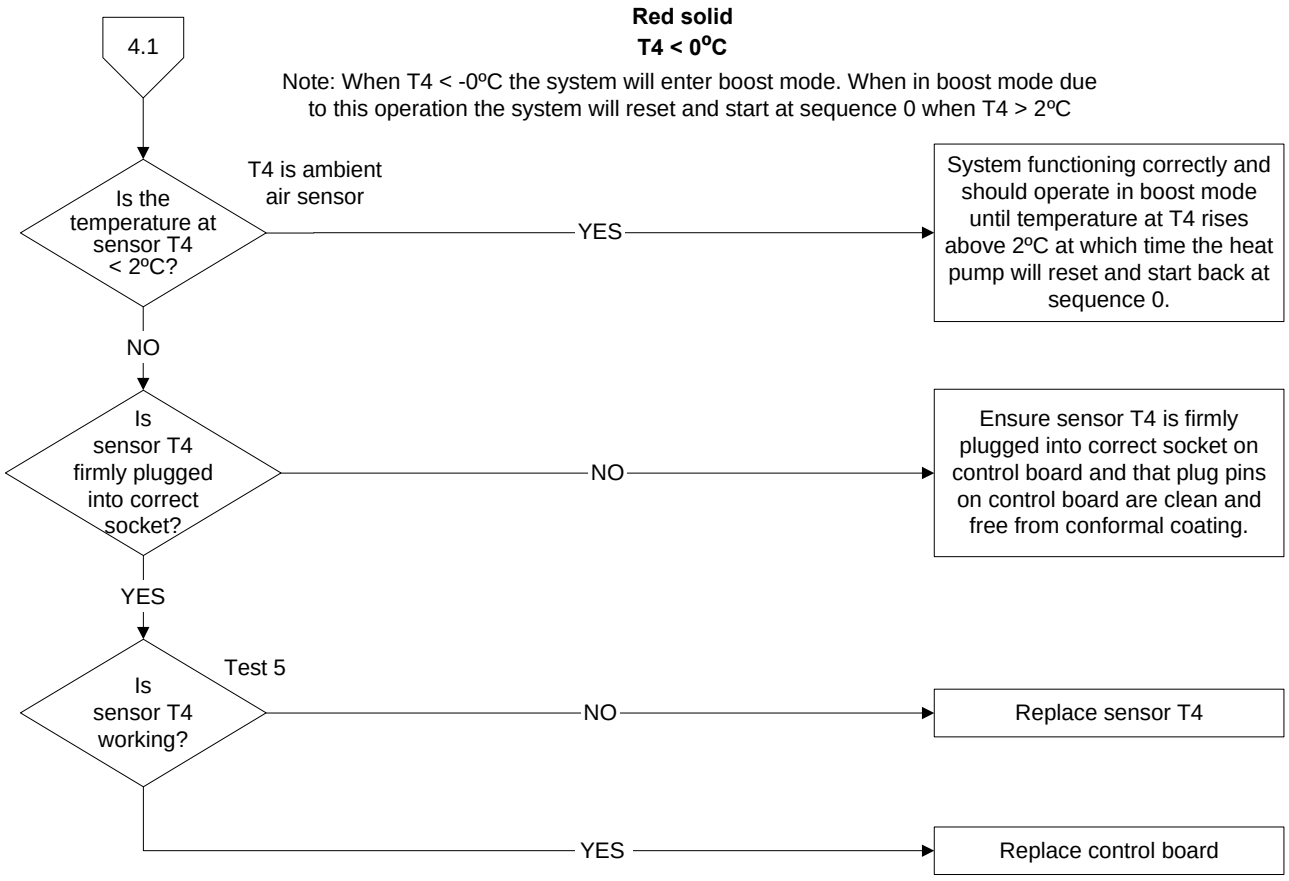
Flashing frequency: Different combinations of flashing LED's (one Red & one Green) will indicate the status of the heat pump. Each flash in a series will last for 0.5 seconds and is separated by 0.5 seconds between flashes. Each series of flashes is separated by 2 seconds.

Other LED indication: If no fault is present the Green LED will flash to indicate the following:

Green solid - Heat pump operating in sequence 0 (standby)
Green 1 flash - Compressor delay start (T3 > 60ºC in seq 0)
Green 2 flash - Heat pump operating in sequence 2
Green 3 flash - Heat pump operating in sequence 3
Green 4 flash - Heat pump operating in sequence 4

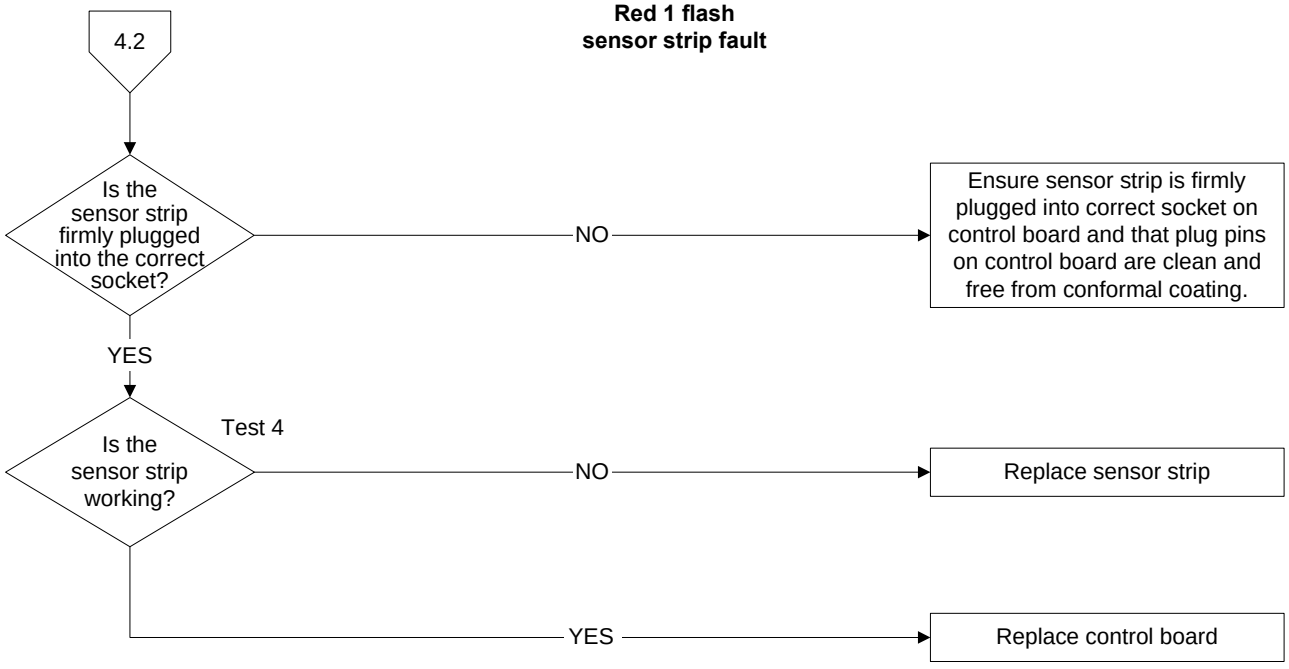
For more information on LED indication refer to pages 12 and13.

Fault Finding – Chart 4.1

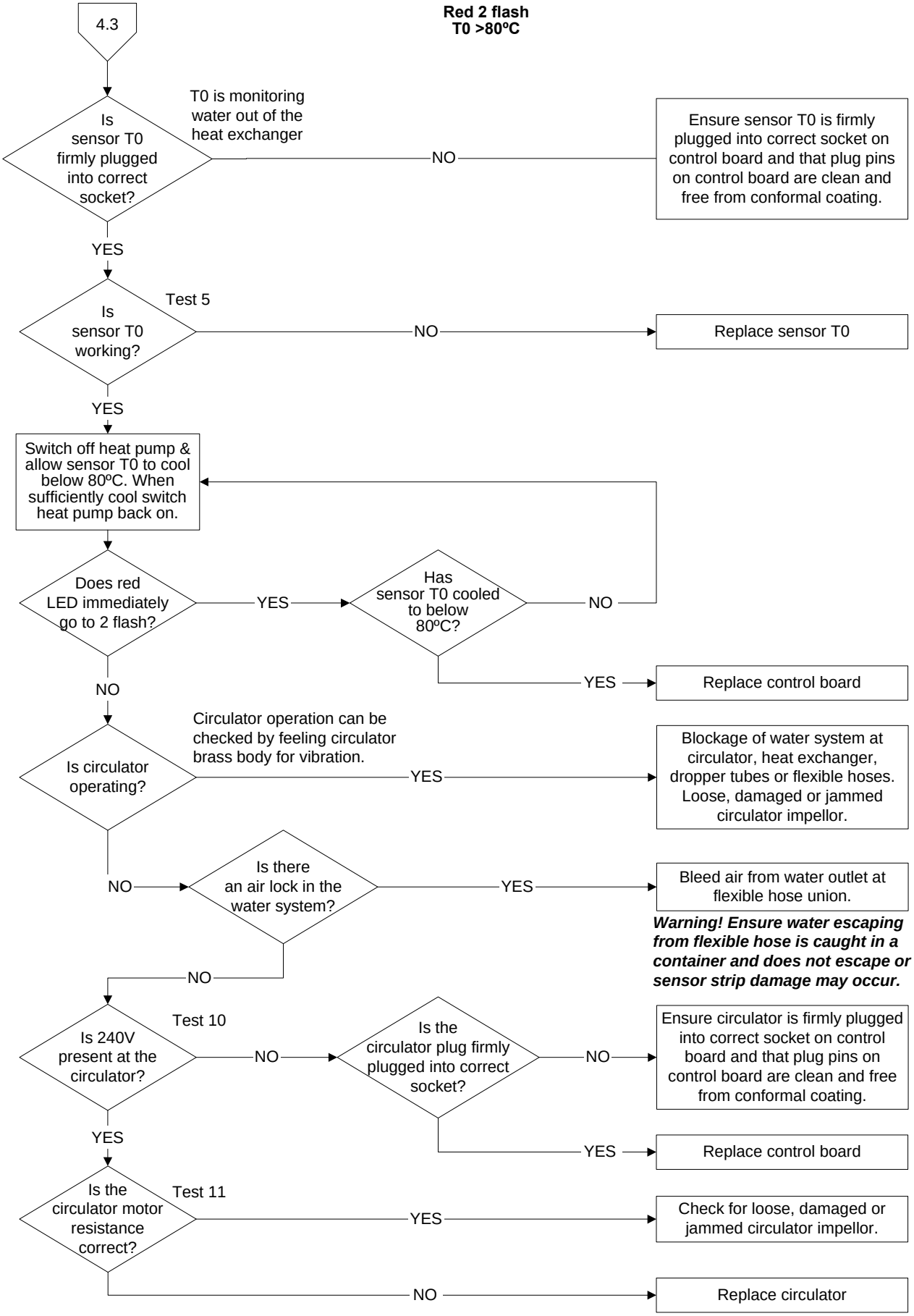


Note: Refer to page 5 for T sensor plug socket location on control board.

Fault Finding – Chart 4.2

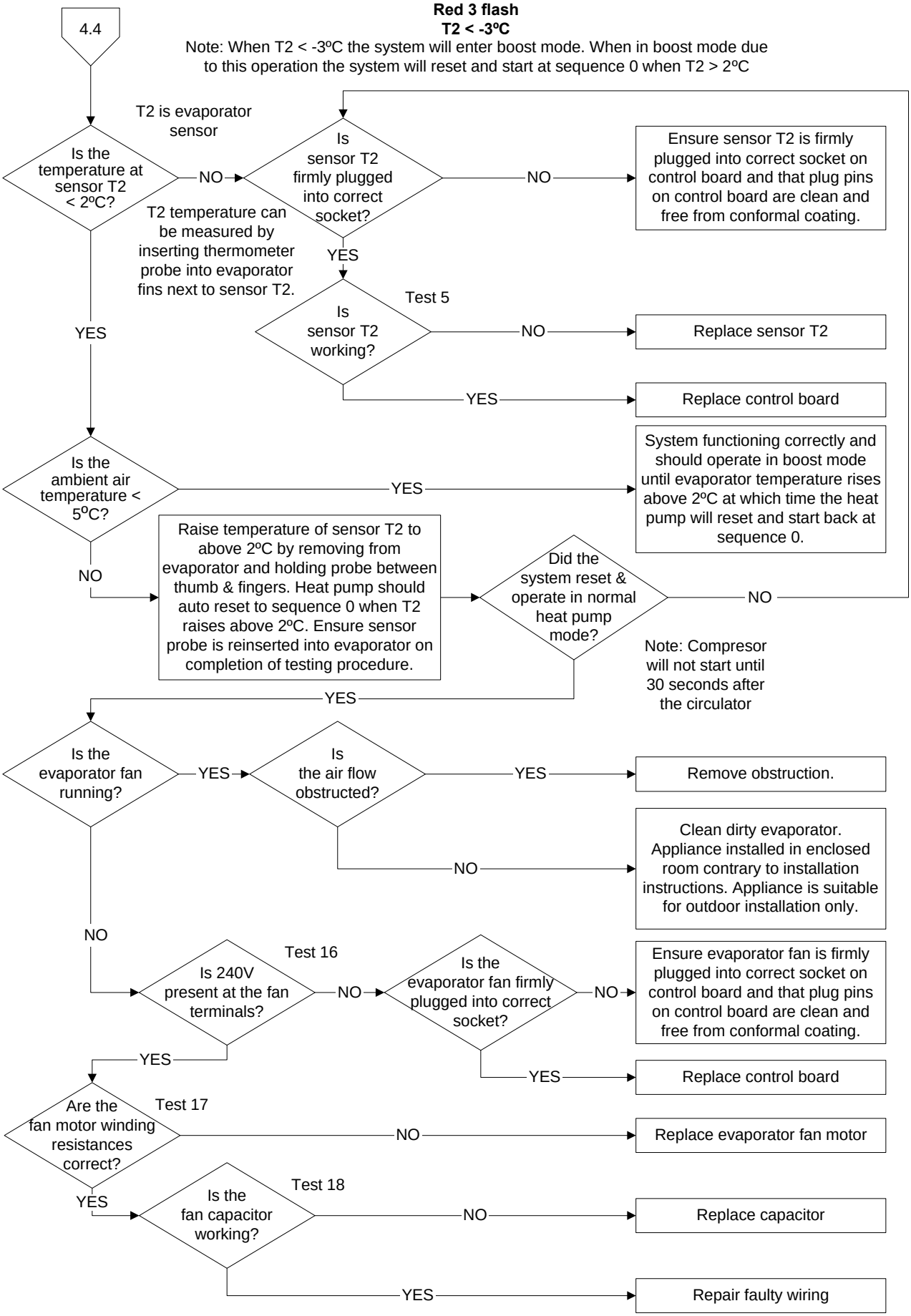


Fault Finding – Chart 4.3



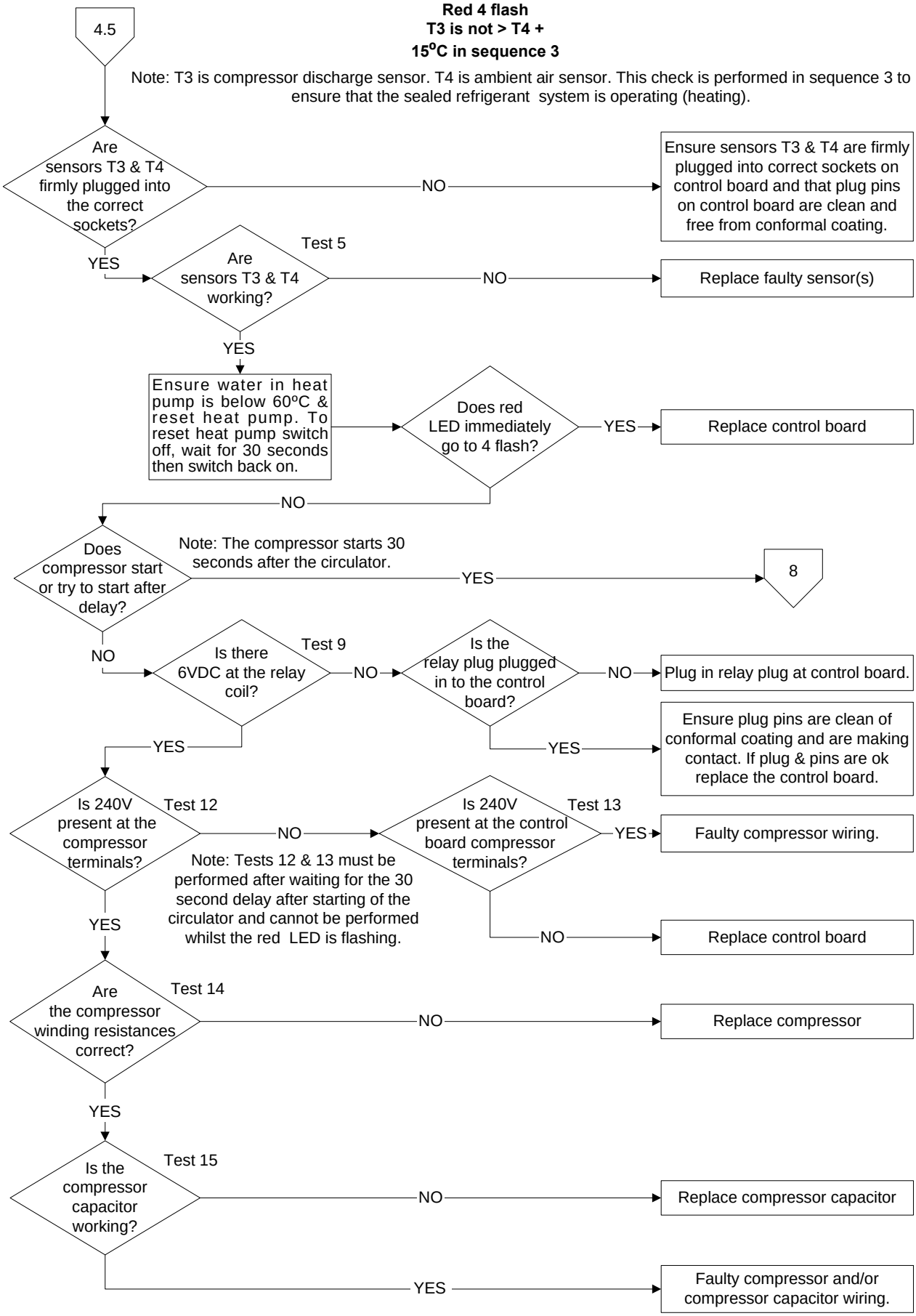
Note: Refer to page 5 for T sensor plug socket location on control board.

Fault Finding – Chart 4.4



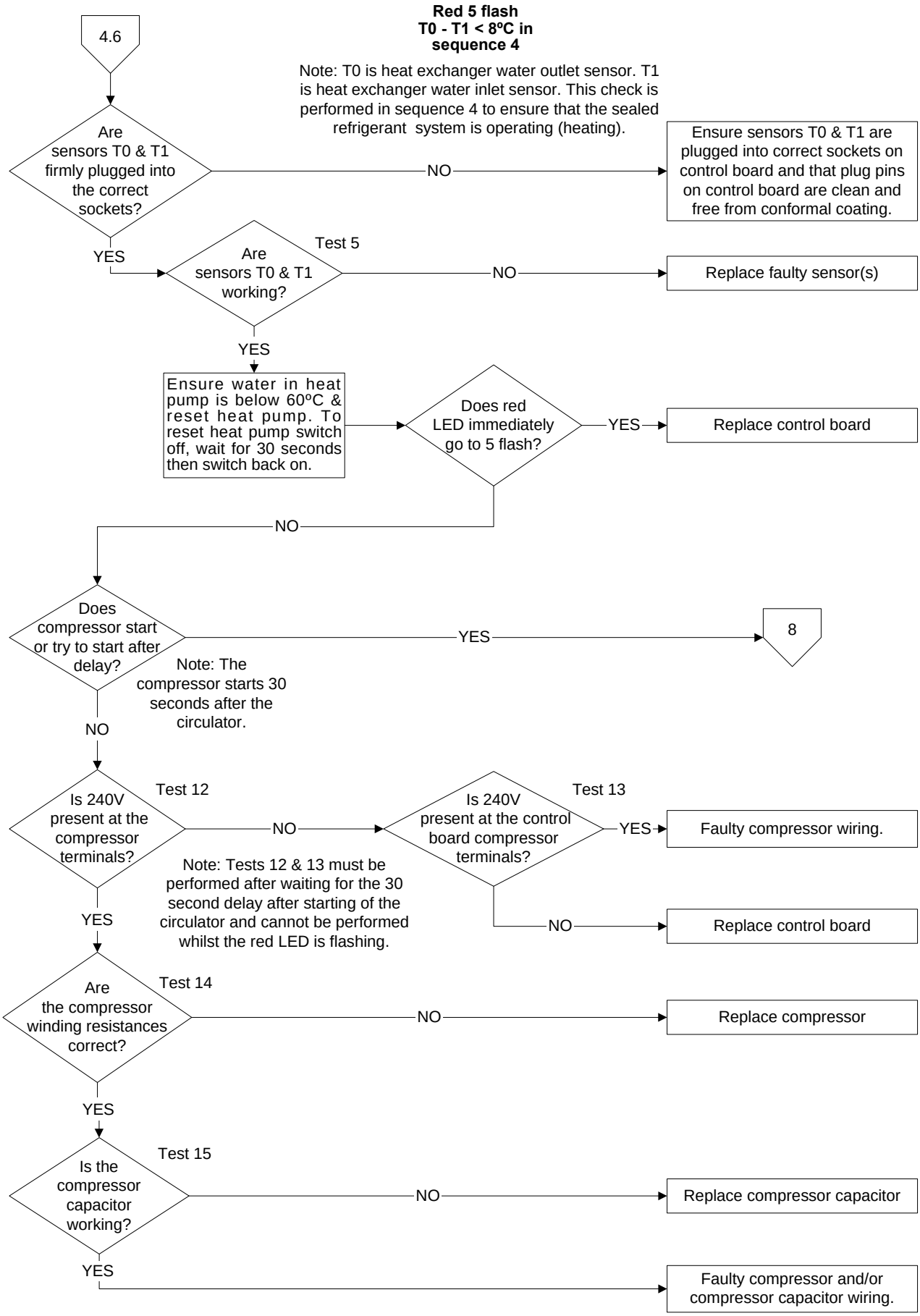
Note: Refer to page 5 for T sensor plug socket location on control board.

Fault Finding – Chart 4.5



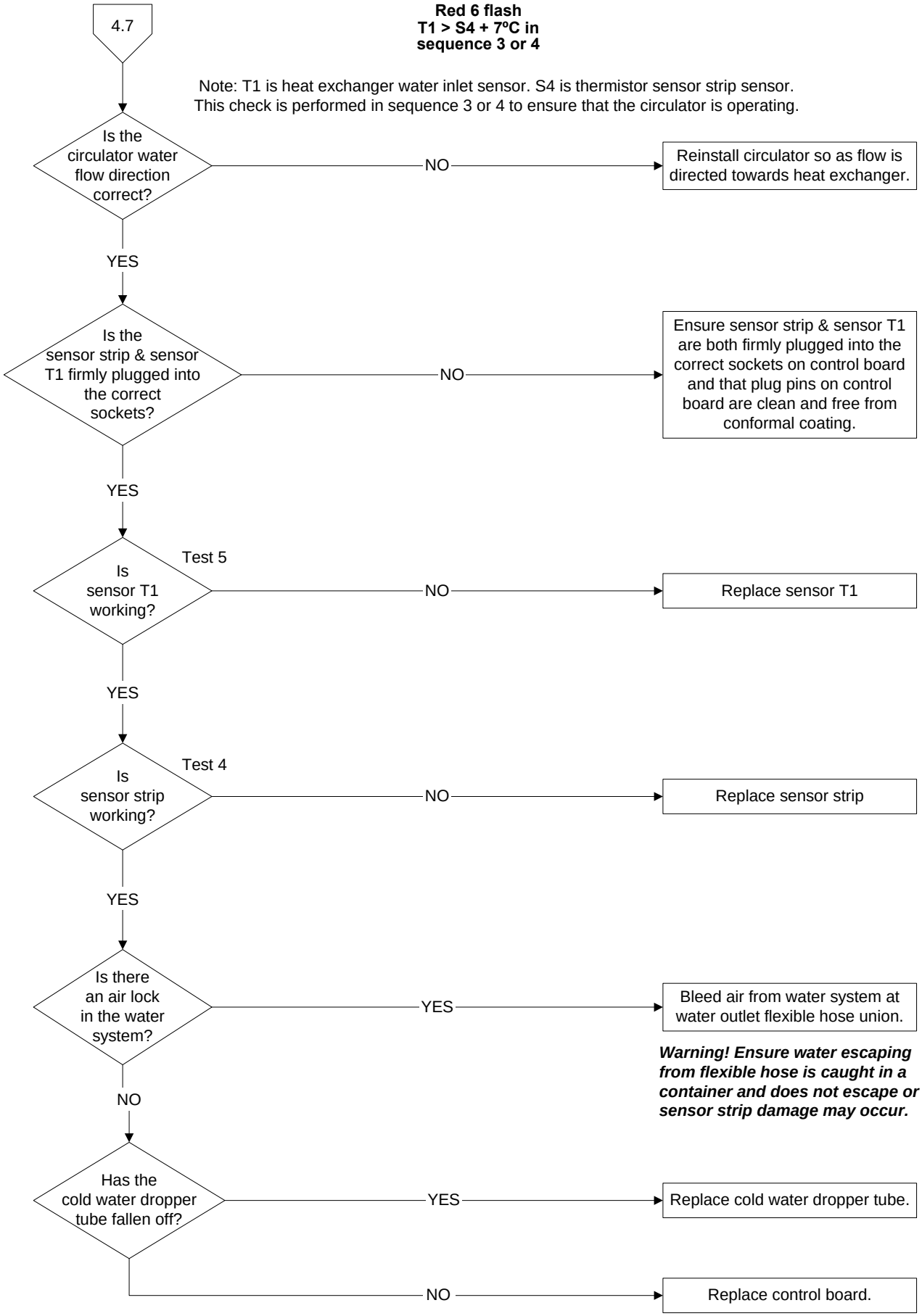
Note: Refer to page 5 for T sensor plug socket location on control board.

Fault Finding – Chart 4.6



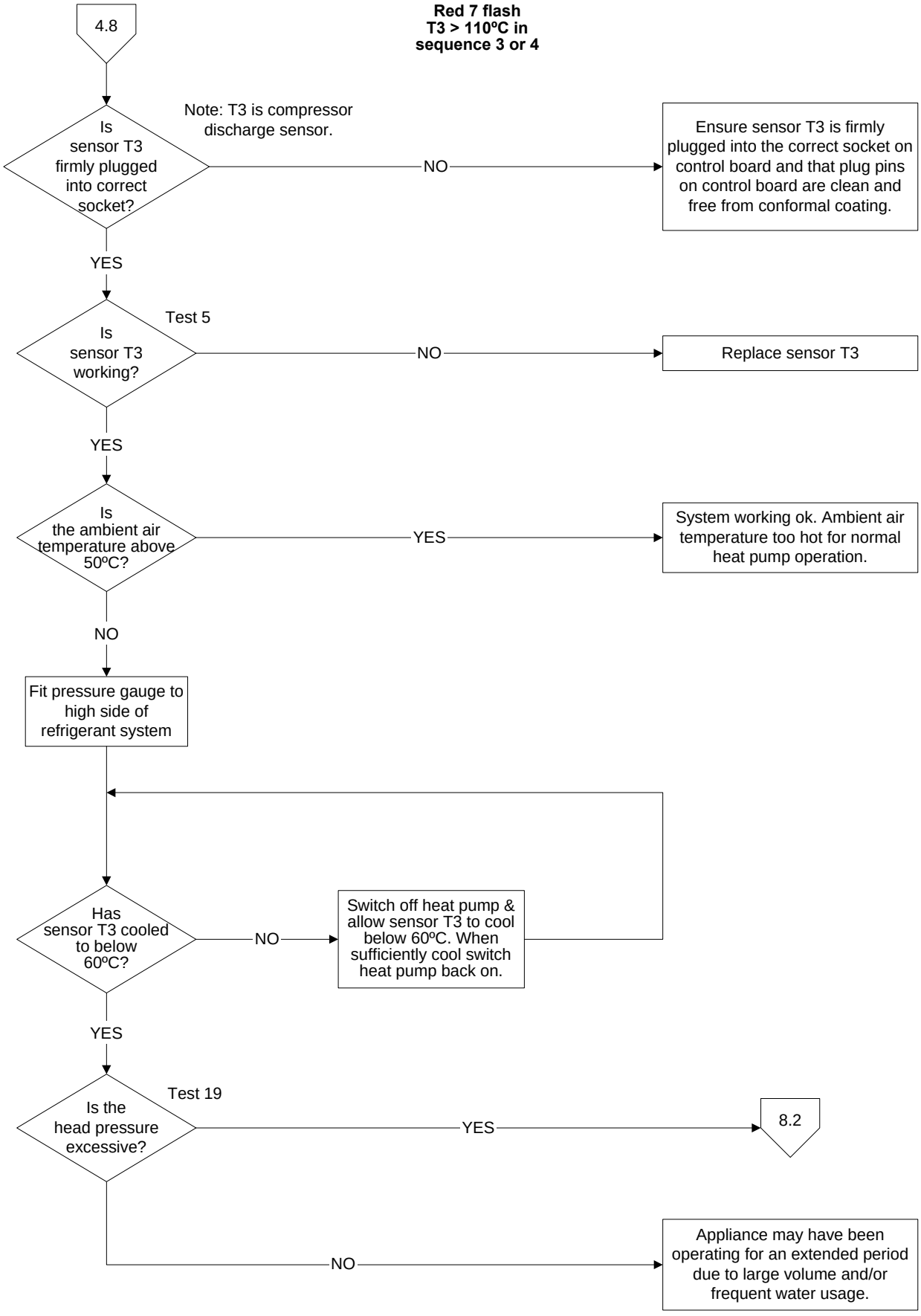
Note: Refer to page 5 for T sensor plug socket location on control board.

Fault Finding – Chart 4.7



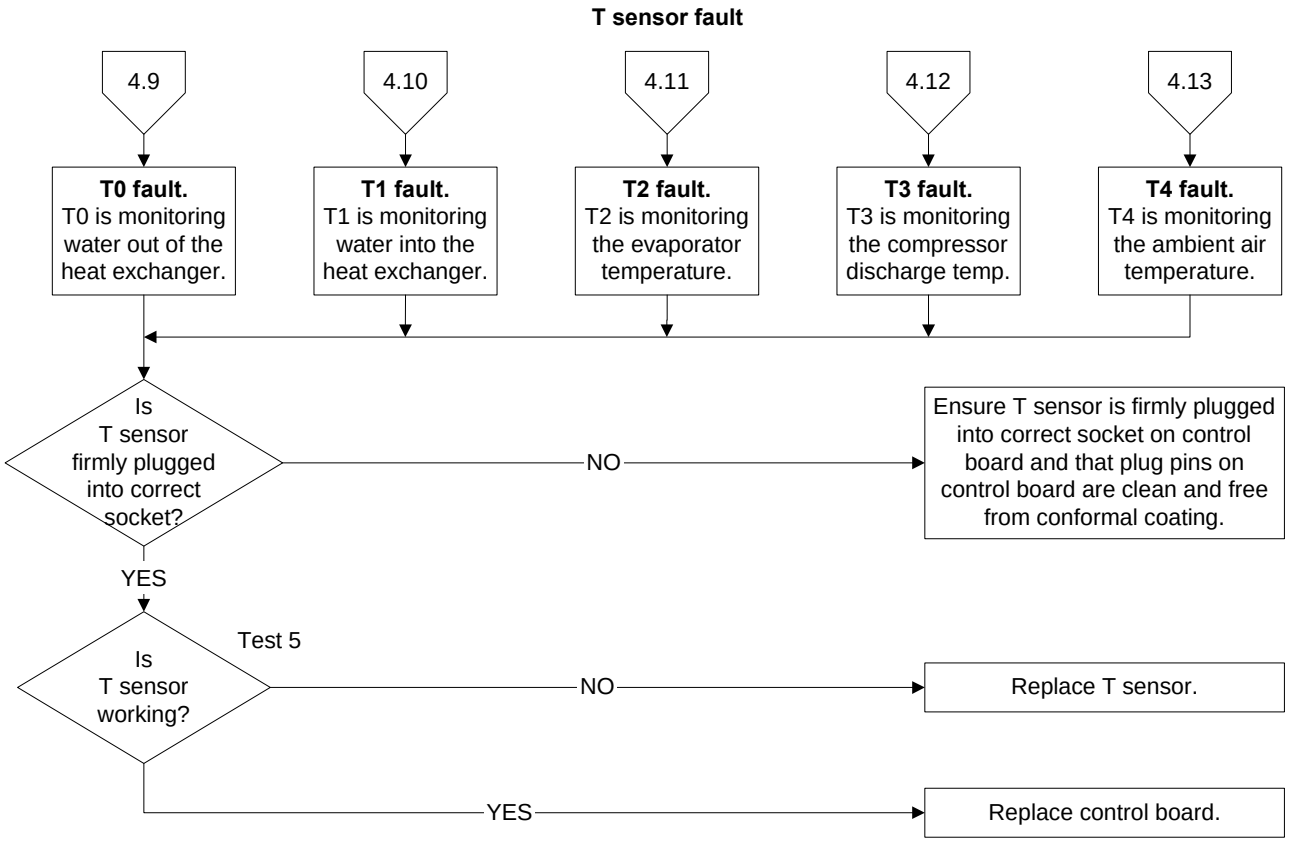
Note: Refer to page 5 for T sensor plug socket location on control board.

Fault Finding – Chart 4.8



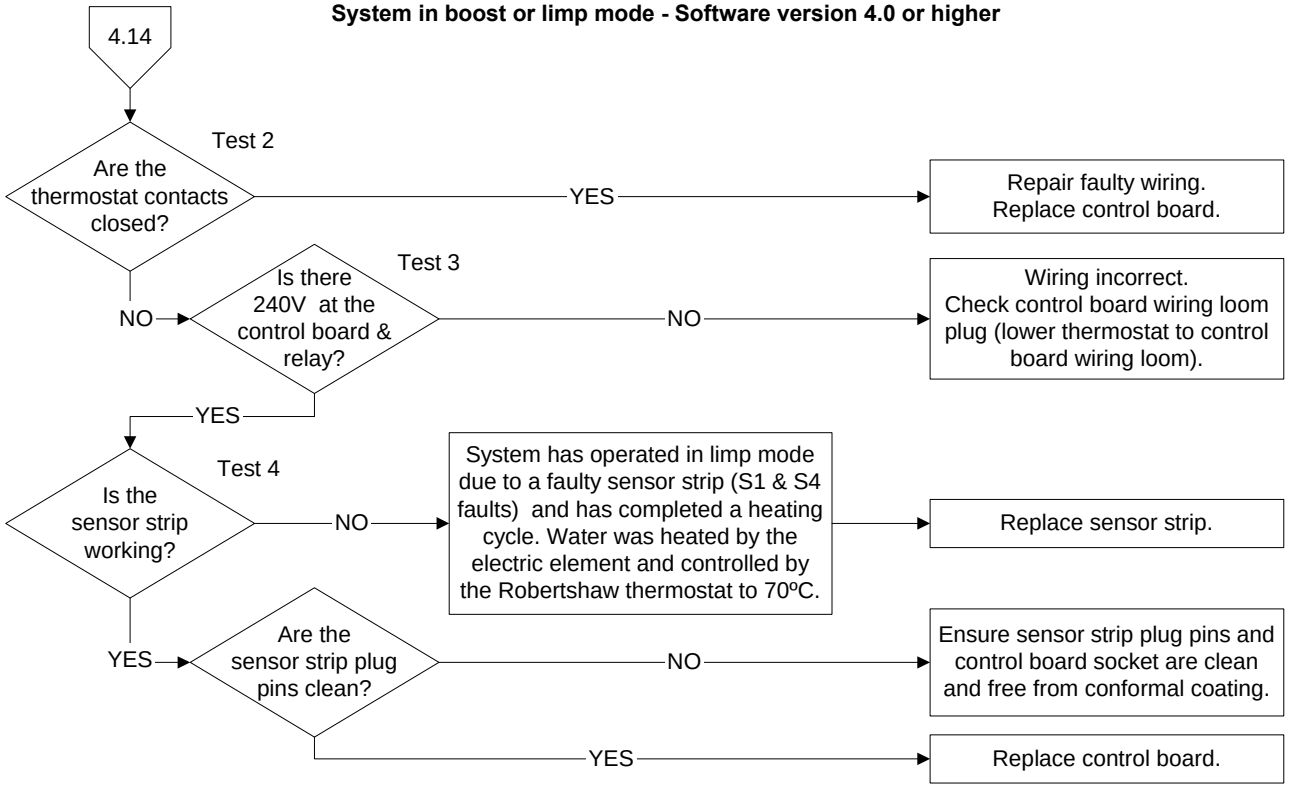
Note: Refer to page 5 for T sensor plug socket location on control board.

Fault Finding – Charts 4.9 to 4.13

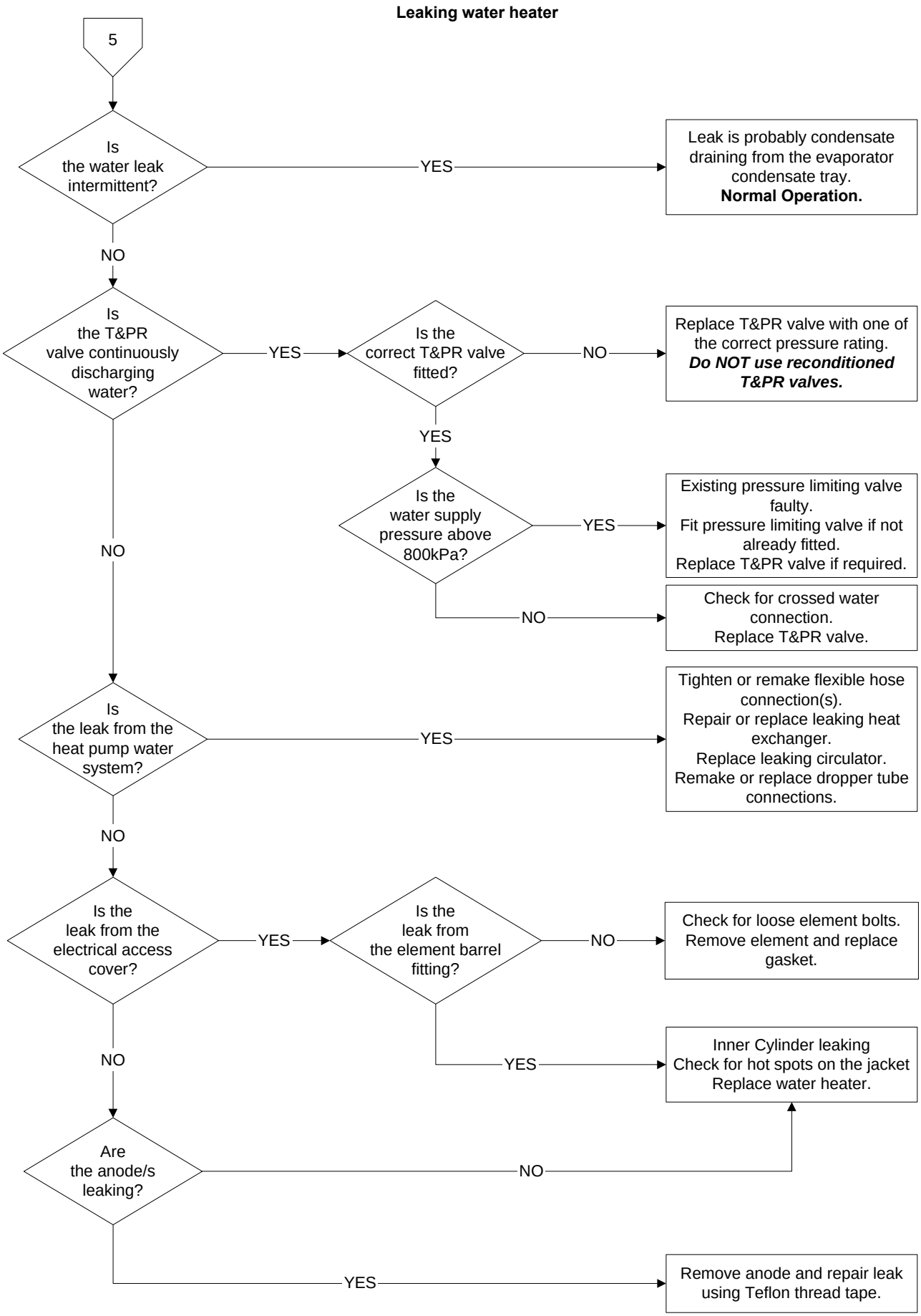


Note: Refer to page 5 for T sensor plug socket location on control board.

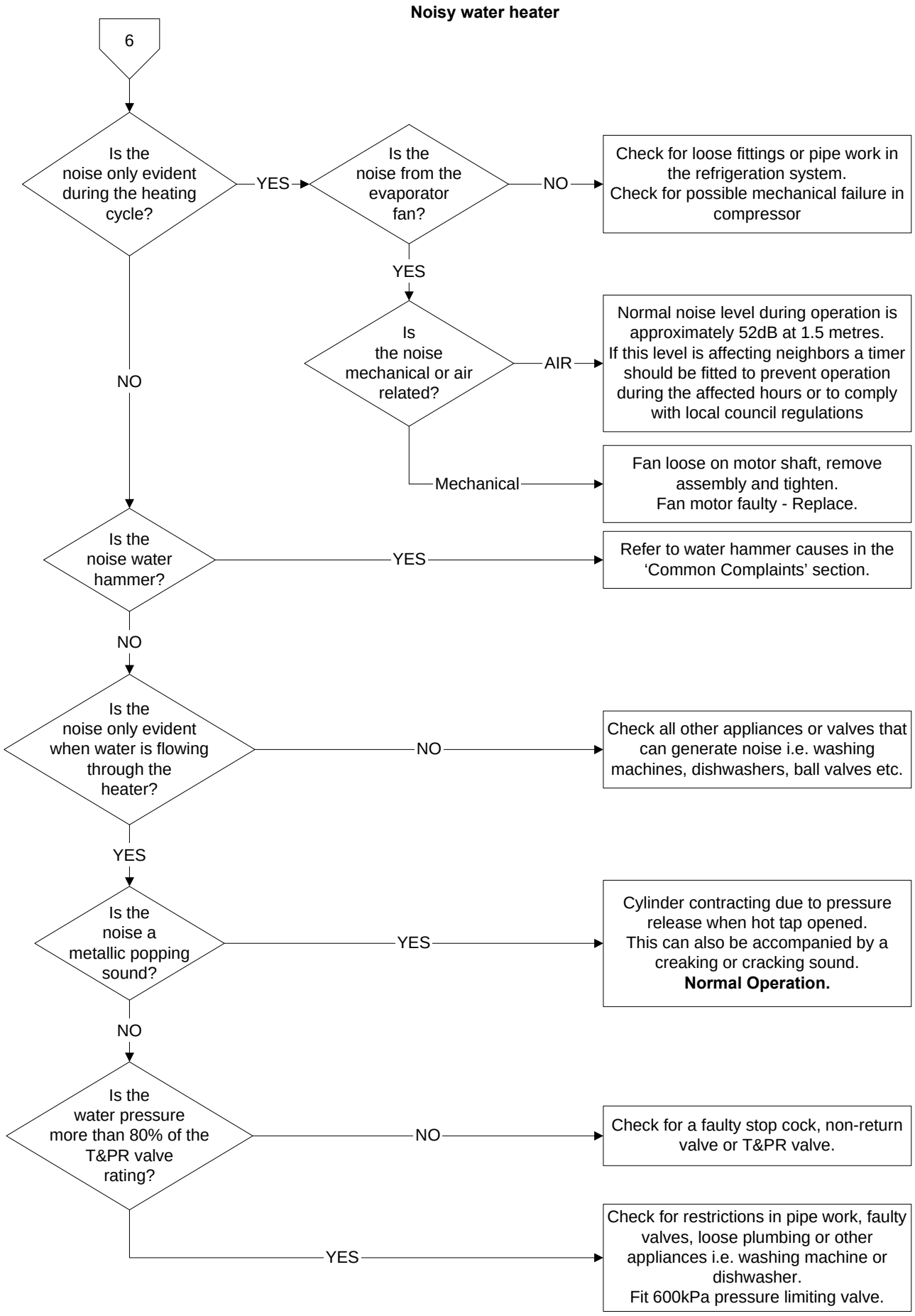
Fault Finding – Chart 4.14

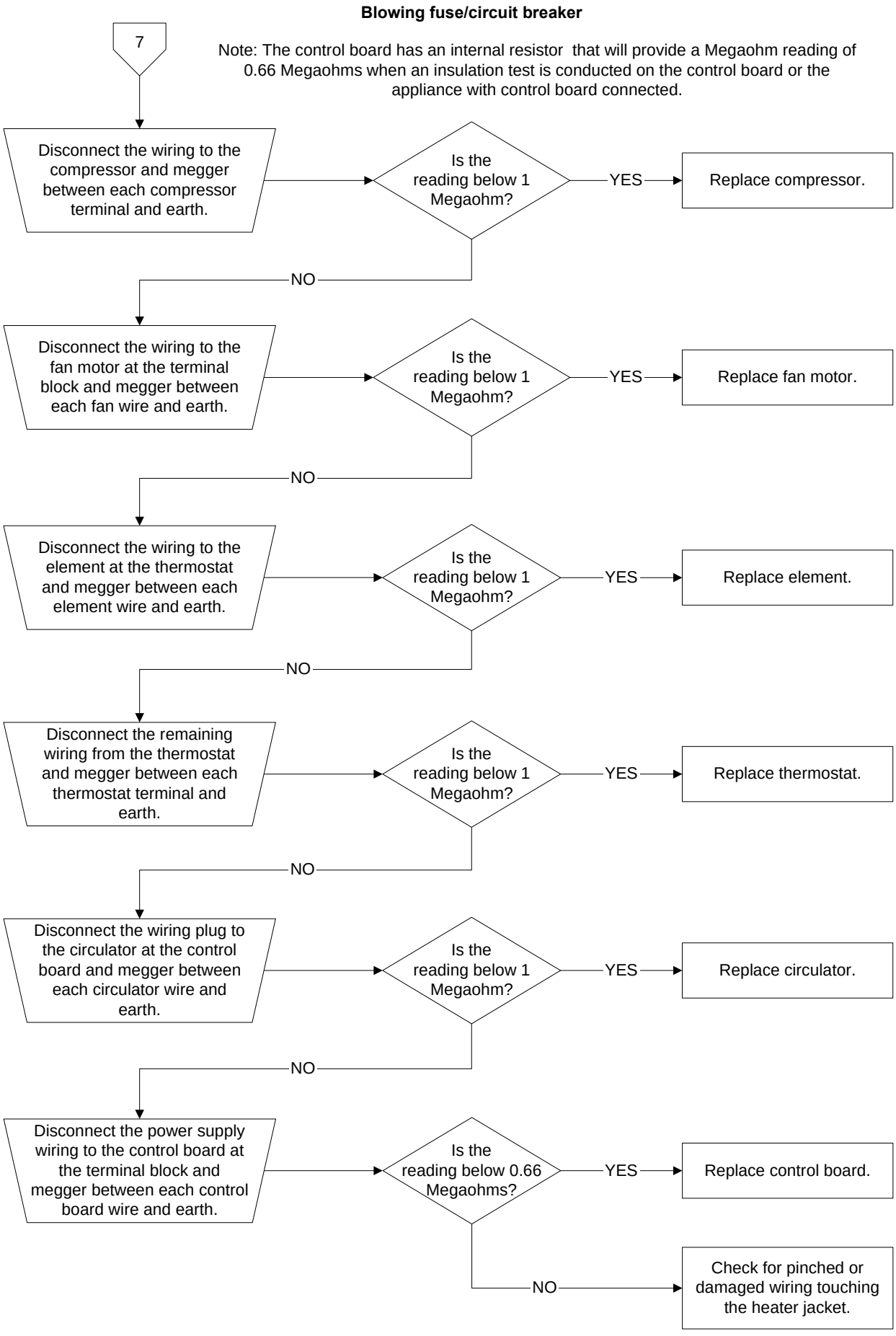


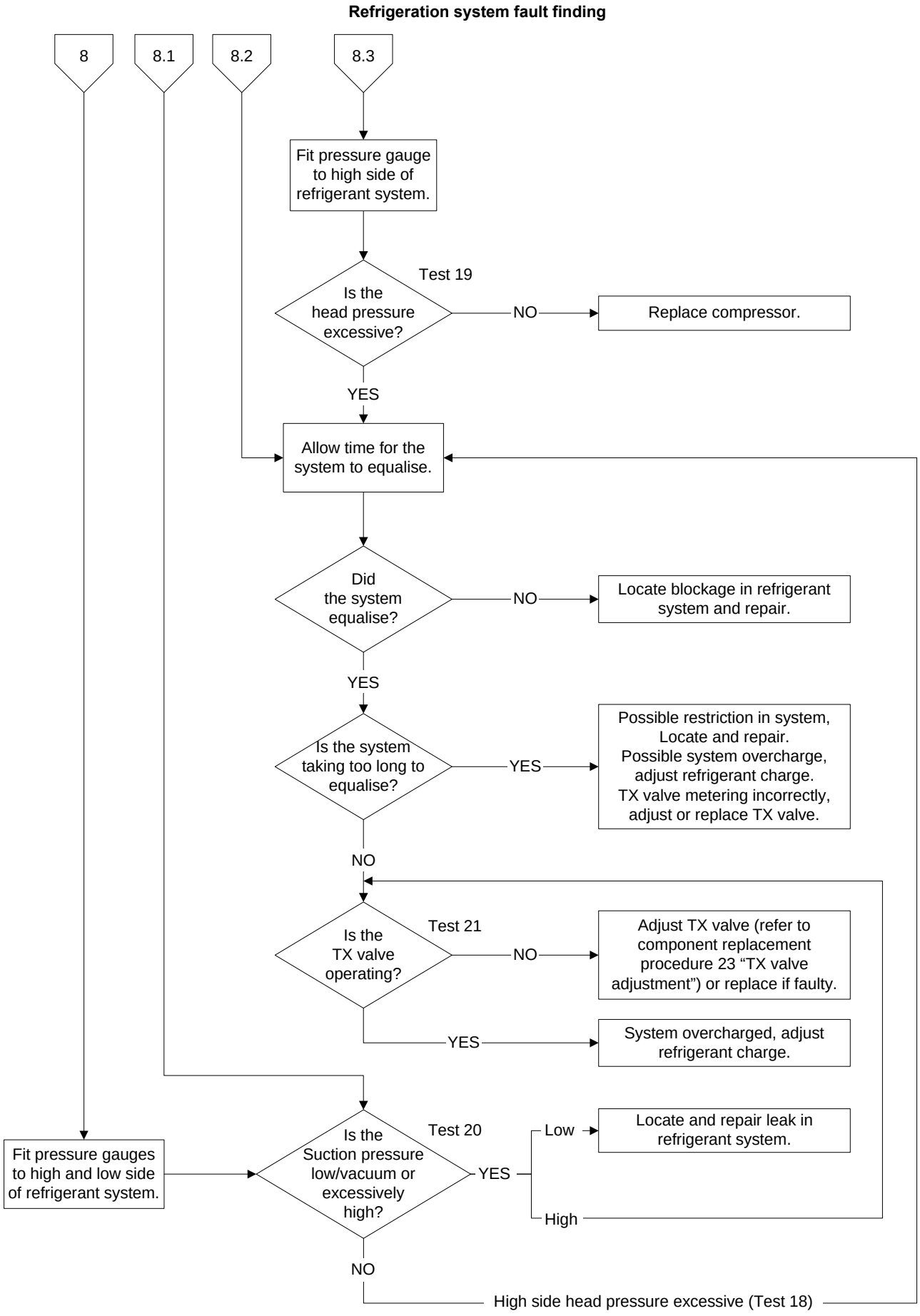
Fault Finding – Chart 5



Fault Finding – Chart 6

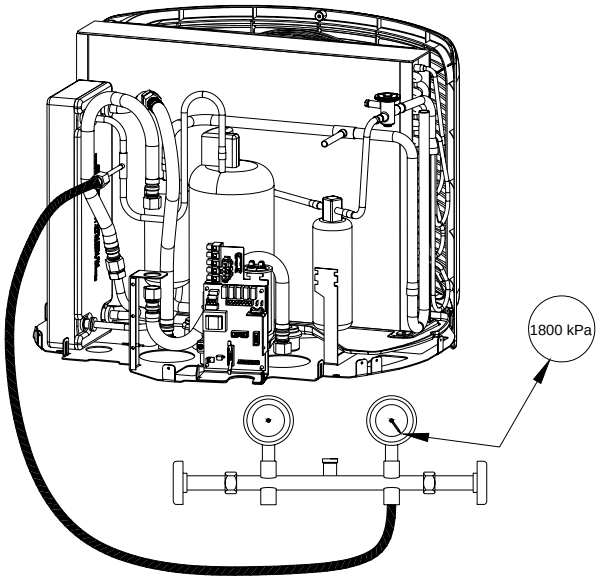






Component Test 19

Warning – "Live" equipment. Wear Personal Protective Equipment when conducting this test.

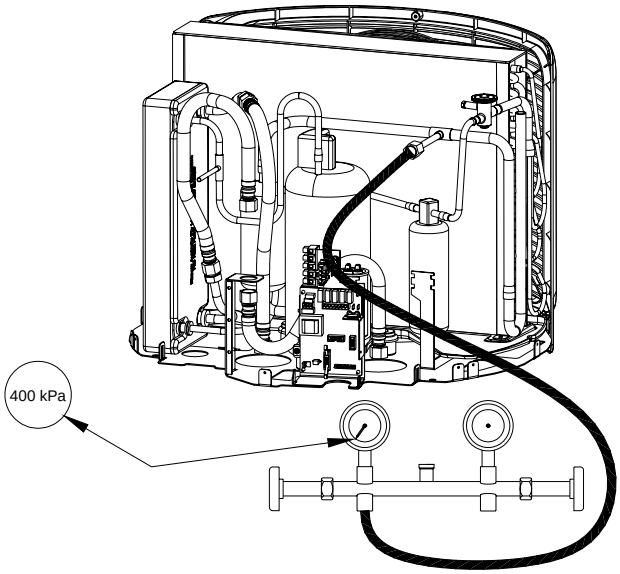


Fit gauges to the high side access pipe and observe the discharge pressure.

Typical high pressure range is 1400-2100 kPa depending on cylinder water temperature. The high pressure range should be within 1700-1800 kPa when heating from cold.

Component Test 20

Warning – "Live" equipment. Wear Personal Protective Equipment when conducting this test.



Check for persistent air bubbles through sight glass of receiver/filter drier. Fit gauges to the low side access pipe and observe the suction pressure.

The suction (low side) pressure is very dependent on ambient conditions however the low pressure range is typically between 200-600 kPa.

200 kPa @ 10°C ambient.
600 kPa @ 45°C ambient.

A suction pressure of less than 200kPa may indicate a refrigerant leak or a malfunctioning TX valve.

Note: Refer to the following section for more information on refrigerant charge and refrigerant charge fault indications.

Refrigerant Charge

Indication of correct refrigerant charge

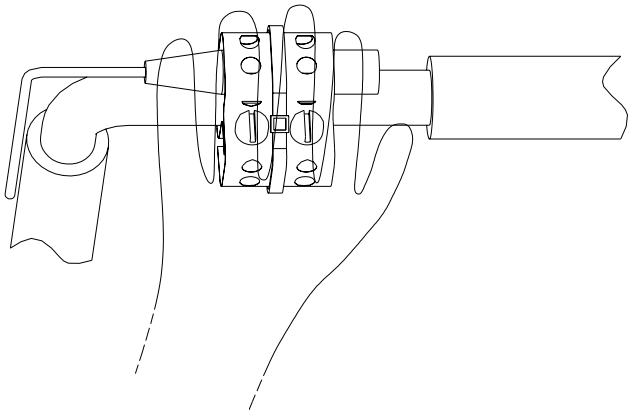
The receiver/filter dryer sight glass should show clear liquid, a few small bubbles might be visible during initial start up of the system or when the TX valve opens quickly, however clear liquid should return shortly after. Compressor current draw should be between 5 – 6 Amps and system pressures should be within normal ranges (refer to component test 19 (above) and component test 20 (above) for typical system pressures).

Indication of undercharged system
Bubbles persist for a significant amount of time or repeat often. Compressor current draw is low (<5 Amps) together with low system pressures. If sight glass indicates clear gas, not liquid, and current draw is very low combined with low discharge line temperature then the system is totally empty. **Note:** Unusual current draw or low suction pressure can be a sign of other problems such as a blockage or malfunctioning TX valve.

Indication of overcharged system
Continuous liquid through sight glass, evaporator tends to flood, head pressure high, compressor current draw high (>6 Amps) and compressor noisy. **Note:** Unusual current draw or high head pressure can be a sign of other problems such as a blockage or malfunctioning TX valve.

Component Test 21

Warning – "Live" equipment. Wear Personal Protective Equipment when conducting this test.



Fit gauges to low side access pipe. Remove the insulation from the TX valve sensor on the suction line.

Hold the sensor by hand to increase the heat detected by the sensor. The TX valve should open with the following results:

1. Flow of refrigerant through sight glass of receiver/filter dryer should increase.
2. Evaporator pressure should increase.
3. Suction line should become cooler.

Remove hand and replace insulation, the TX valve should close, resulting in the reversal of the above results.

Electrical Insulation Testing

There are three basic test procedures that should be carried out when the operation and function of a heat pump water heater's electrical system is in doubt.

Wear Personal Protective Equipment when conducting step 1 of this procedure to reduce the risk of electric shock. Refer to Rheem safety procedure on electrical testing.

Insulation resistance of the water heater Neutral Circuit. (Reading not to be below 0.66 Mega ohm).

1. ***Isolate power to the water heater at the isolation switch. Confirm with multi-meter across terminal block Active and Neutral, then Active and Earth, then Neutral and Earth that voltage is not present.***
2. Once satisfied, disconnect the Active and Neutral wires from the water heater terminal block.
3. Connect megger leads to the Neutral of the water heater wiring and Earth.
4. Operate megger. A reading above 0.66 Mega ohm should be obtained.
5. If a reading below 0.66 Mega ohm is indicated, all component parts will need to be individually tested to locate the fault. Refer to Fault Finding Chart 7 on page 43.

Insulation resistance of the water heater Active Circuit (reading not to be below 0.66 mega-ohm).

6. Connect megger leads to the Active of the water heater wiring and Earth.
7. Operate megger. A reading above 0.66 Mega ohm should be obtained.
8. If a reading below 0.66 Mega ohm is indicated, all component parts will need to be individually tested to locate the fault. Refer to Fault Finding Chart 7 on page 43.

To check "Continuity" of the Heat Pump electrical circuit.

9. Set megger to resistance scale or multimeter to x1 resistance scale.
10. Measure between the Active and Neutral terminals on the power supply terminal block located behind the electrical/element access cover. The resistance should be approximately 24 ohms. If a reading outside this resistance is measured all electrical component parts will need to be individually tested to locate the fault. Refer to Specifications table on page 3 for indicative resistance values of components.
11. Reconnect active cable to 'A' terminal and neutral cable to 'N' terminal at heater terminal block.
12. Replace fuse. ***Note: If continuing with any diagnostic procedures do not replace the fuse.***

Component Replacement Procedures – Water Heater

Draining the Water Heater (Procedure 1)

Elevated temperatures may be present during the draining process. Wear Personal Protective Equipment to prevent scalds or burns.

Wear Personal Protective Equipment when conducting step 3 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T & PR valve or a hot tap.***
3. ***Remove the lower electrical/element access cover and confirm with a multi-meter between the Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
4. Disconnect the cold water supply pipe
5. Fit a drain hose to the cold-water connection and run the other end to a drain or safe location.
6. Open the temperature and pressure relief valve to allow air into the system.

Temperature and Pressure Relief Valve (Procedure 2)

Never fit a T&PR valve with a rating higher than that indicated on the water heater rating plate. Do not use reconditioned T&PR valves.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T & PR valve or a hot tap.***
3. Remove the drain line from the T&PR valve.
4. Unscrew the T&PR valve and remove.

A quantity of hot water will discharge from the tank during this process. Wear Personal Protective Equipment to prevent scalds or burns.

5. Confirm the replacement T&PR valve is the correct rating and refit using thread tape.
6. Refit the drain line.
7. Close the hot tap and restore water supply.
8. Check T&PR valve thread for leaks.
9. Operate the T&PR valve lever to reset relief drain.
10. Purge air from the system through hot taps.
11. Restore the power supply to the water heater.

Dip Tube (Procedure 3)

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T & PR valve or a hot tap.***
3. Disconnect the hot water line from the outlet of the water heater.

A quantity of hot water will discharge from the outlet during this process. Wear Personal Protective Equipment to prevent scalds or burns.

4. Using a flat blade screwdriver gently split the outer rim at the top and bottom of the dip tube face and prise the dip tube out of the cylinder fitting.
5. Fit the replacement dip tube into the cylinder fitting ensuring the flat lines up with the fitting (dip tube facing up) and gently drive the dip tube into the fitting a short distance.
6. Reconnect the plumbing; this will push the dip tube into the correct location.
7. Restore the water supply and purge air from the system through hot taps.
8. Restore the power supply.

Mechanical Thermostat (Procedure 4)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power to the water heater*** and remove access cover.
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Disconnect the wiring to the thermostat.
4. Slide the thermostat out from under the retaining clamp.
5. Remove any scale from the cylinder surface.
6. Fit the replacement thermostat under the clamp.
7. Reconnect the wiring as per the circuit wiring diagram on page 11.
8. Conduct an electrical insulation test. Refer to page 46.
9. Refit the access cover and restore the power supply.

Anode (Procedure 5)

Elevated temperatures may be present during anode removal process. Wear Personal Protective Equipment to prevent scalds or burns.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the cylinder through the T & PR valve.***
3. Remove the air inlet louver (Refer to Procedure 10).
4. Remove the refrigeration section jacket top.
5. Remove the anode cap(s). Access is provided through the refrigeration plant chassis.
6. Using a 27mm tube or socket spanner remove the anode(s).
7. Apply thread seal tape to replacement anode, refit and tighten. Note: It may be necessary to cut the anode to length prior to fitting. Refer to page 3 for the correct anode length.
8. Restore water supply and check for leaks.
9. Refit the anode cap(s), jacket, air inlet louver and jacket top and restore power.

Heating Unit (Procedure 6)

Wear Personal Protective Equipment when conducting step 1 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Drain the water heater. Refer to procedure 1.***
2. Remove the access cover and disconnect the wiring from the terminal block. Disconnect the wiring to the heating unit from the thermostat. Unclip the terminal block from the jacket and remove thermostat and terminal block.
3. Remove the two screws retaining the thermostat clamp.
4. Loosen the two lower screws slightly. When water is below the heating unit level, refit the cold water supply pipe.
5. Remove the two lower screws and withdraw the heating unit carefully making sure the loop does not catch and open up inside the cylinder.
6. Clean around the cylinder fitting, fit gasket to replacement heating unit and insert into water heater. Note: Ensure the element is installed in the same orientation.
7. Replace screws and thermostat clamp, and then tighten.
8. Close T&PR valve, and open all hot taps. Restore the cold water supply and purge air through hot taps, close each hot tap as water runs freely.
9. Check heating unit for leaks.
10. Refit thermostat and terminal block and reconnect the wiring as per the circuit wiring diagram on page 11.
11. Refit the access cover.
12. Restore power supply to the water heater.

Dropper Tube(s) (Procedure 7)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

In order to replace the dropper tube(s) the heat pump (refrigeration) module must be removed and refitted. Due to the weight of the unit (approx 45kgs) this is a two man job.

A quantity of hot water may discharge from the flexible hose(s) during this procedure. Wear Personal Protective Equipment to prevent scalds or burns and ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the cylinder through the T & PR valve.***
4. Remove the refrigeration module (refer to procedure 9 steps 4 - 9).
5. Remove the sensor strip wiring grommet from the jacket top.
6. Loosen the main power wiring cable clamp screw.
7. Carefully remove the jacket top. Note: During the foaming process the foam adheres to the jacket top which can make it difficult to remove.
8. Clear foam from around the dropper tube(s) ¾" to ½"brass fitting(s).
9. Using an extra deep 35mm socket unscrew the dropper tube(s) brass fitting(s) in an anticlockwise direction. Note: the 35mm socket must have a minimum internal nut clearance depth of 40mm.
10. Withdraw brass adapter(s) and dropper tube(s) from cylinder. Note: dropper tube is a push fit into the tapered section of the brass adapter, simply pull dropper tube to remove.
11. Complete reassembly in reverse order of above using thread tape on dropper tube(s) brass adapter(s) threaded section.

Sensor Strip (Procedure 8)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

In order to replace the sensor strip the heat pump (refrigeration) module must be removed and refitted. Due to the weight of the unit (approx 45kgs) this is a two man job.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration module (refer to procedure 9).
4. Remove the sensor strip wiring grommet from the jacket top.
5. Loosen the main power wiring cable clamp screw.
6. Carefully remove the jacket top. Note: During the foaming process the foam adheres to the jacket top which can make it difficult to remove.
7. Carefully remove the foam insulation from around the sensor strip wiring until the sensor strip pocket can be seen (approx 150 – 200mm down), adjacent to the cylinder top. Note: Save the foam insulation for repacking in step 14 of this procedure.
8. Carefully grip the sensor strip and slide the sensor strip out, ensure that the sensor strip pocket has also not been gripped. **Note: The fitment between the sensor strip and the pocket is quite firm, do not pull on the wires only as they will break away from the strip.**
9. Carefully insert the replacement sensor strip into the pocket. **Note: When reinserting the replacement sensor strip ensure the plastic backing is facing AWAY from the cylinder.** The strip will need to be supported by hand to prevent it bending as it is inserted into the pocket and it must be fully inserted to operate correctly. **Lubricants of any kind must NOT be used.**
10. Re-pack the foam removed in step 11 into the hole.
11. Complete reassembly in reverse order of above.
12. Restore water and electricity supplies and check heat pump operation.

Refrigeration Module (Procedure 9)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

Due to the weight of the refrigeration unit (approx 45kgs) this is a two man job.

A quantity of hot water may discharge from the flexible hose(s) during this procedure. Wear Personal Protective Equipment to prevent scalds or burns and ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the cylinder through the T & PR valve.***
4. Remove the front and rear air louvres.
5. Undo the controller cover retaining screw, remove the controller cover and disconnect the sensor strip and power supply wiring loom plugs from the electronic controller.
6. If fitted, disconnect the condensate drain.
7. Disconnect the hot and cold flexible hoses connecting the heat pump module to the cylinder at the cylinder fittings (refer to owners guide for location). ***Note: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.***
8. Remove the 3 x 6mm bolts retaining the heat pump module to the cylinder (refer to owners guide for location).
9. Slide lifting bars (part number 080151) through the slots provided in the chassis (refer to owners guide for location) and lift the heat pump module clear of the cylinder.
10. Complete reassembly in reverse order of above.

Air Inlet Louver (Procedure 10)

1. ***Isolate the power to the water heater.***
2. Remove the refrigeration section jacket top.
3. Remove the 2 screws from the left and right hand sides of the air inlet louver.
4. Remove the 3 screws from the Colorbond trim directly below the air inlet louver.
5. Lift the louver clear of the jacket.
6. Complete reassembly in reverse order of above.

Refrigeration Section Jacket (Procedure 11)

The fan motor may commence operation without warning. Failure to isolate the power may result in serious injury if the fan commences operation during the removal process.

1. Remove the air inlet louver (refer to Procedure 10).
2. Remove the air outlet cover.
3. Remove the handle.
4. Remove the screws retaining the jacket to the water heater and lift the jacket clear. Note: The refrigeration section jacket is quite flexible, care should be taken to ensure it does not kink during removal or replacement.
5. Complete reassembly in reverse order of above.

Evaporator Fan Motor (Procedure 12)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

The fan motor may commence operation without warning. Failure to isolate the power may result in serious injury if the fan commences operation during the removal process.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration section jacket (refer to Procedure 11).
4. Undo the controller cover retaining screw, remove the controller cover and disconnect the wiring to the fan motor from the terminal block. Cut wiring loom cable ties and remove fan wiring.
5. Remove the 2 screws retaining the fan shroud to the evaporator.
6. Slide the shroud up to disengage the locating tabs and lift clear.
7. Undo the nut retaining the fan blade to the motor shaft and remove the blade.
8. Undo the 3 nuts retaining the motor to the shroud and remove the motor.
9. Complete reassembly in reverse order of above.

Control Board (Procedure 13)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10).
4. Undo the controller cover retaining screw, remove the controller cover and unplug power supply wiring loom, T sensors, circulator, fan and sensor strip plugs from control board.
5. Mark and disconnect compressor wiring from control board.
6. Remove two screws retaining control board bracket to refrigeration base and remove control board.
7. Complete reassembly in reverse order of above.

Relay (Procedure 14)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10).
4. Undo the controller cover retaining screw, remove the controller cover and disconnect wiring to compressor capacitor.
5. Remove cable tie retaining compressor capacitor and remove compressor capacitor.
6. Mark and disconnect wiring to relay, remove two relay retaining screws and remove relay.
7. Complete reassembly in reverse order of above.

Compressor Capacitor (Procedure 15)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10).
4. Undo the controller cover retaining screw, remove the controller cover and disconnect wiring to compressor capacitor.
5. Remove cable tie retaining compressor capacitor and remove compressor capacitor.
6. Complete reassembly in reverse order of above.

Fan Capacitor (Procedure 16)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10).
4. Undo the controller cover retaining screw, remove the controller cover and disconnect wiring to compressor capacitor
5. Remove cable tie retaining compressor capacitor and remove compressor capacitor.
6. Disconnect wiring to fan capacitor, remove two fan capacitor retaining screws and remove fan capacitor.
7. Complete reassembly in reverse order of above.

Circulator (Procedure 17)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

A quantity of hot water may discharge from the circulator flexible hoses during this procedure. Wear Personal Protective Equipment to prevent scalds or burns and ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the cylinder through the T & PR valve.***
4. Remove the air inlet louver (refer to Procedure 10).
5. Remove circulator electrical cover, disconnect wiring and remove wiring from circulator compression gland.
6. Unscrew circulator flexible hose unions. ***Note: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.***
7. Unscrew circulator inlet adapter and remove circulator from supporting bracket.
8. Complete reassembly in reverse order of above.

T sensor(s) (Procedure 18)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power supply to the water heater.***
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10).
4. Undo the controller cover retaining screw and remove the controller cover.
5. Unplug the T sensor plug from the control board.
6. Remove insulation surrounding T sensor (if applicable).
7. Remove sensor retaining clip and withdraw sensor. Note: Ambient air sensor is held in place by a locking nut and evaporator sensor is held in place by a cable tie. Ambient air sensor retainer can be manoeuvred out of cable tie. Do not cut cable tie as it is difficult to replace.
8. Cut wiring loom cable ties and remove T sensor and wiring.
9. Complete reassembly in reverse order of above.

Component Replacement Procedures – Sealed Refrigeration System

Personnel qualified and licensed to work with refrigerants may only carry out the following repair procedures to the sealed refrigeration system.

The following procedures assume that all work conducted conforms to the refrigeration code of good practice. During repair the refrigerant must be recovered, not vented to atmosphere.

Evaporator (Procedure 19)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the evaporator shroud and fan assembly (refer to Procedure 12 Steps 3 - 6).
4. Remove the evaporator T sensor clip from the cable tie and remove the T sensor from the evaporator finning.
5. Recover refrigerant from sealed refrigeration system.
6. Remove the pipe insulation to expose pipe work at the evaporator. Un-braze the pipe-work to the evaporator.
7. Remove the 4 screws retaining the evaporator to the chassis and lift evaporator clear.
8. Fit and secure the replacement evaporator and braze pipe work.
9. Replace the receiver/filter drier. (Refer to Procedure 20 – steps 4 to 7)
10. Pressurise system to 3000kPa and conduct a leak test. Refit and secure pipe work insulation.
11. Evacuate system to 100 microbar (30”) for a period of at least 30 minutes.
12. Recharge system with the correct refrigerant. Refer to specifications table on page 3.
13. Refit the evaporator shroud and fan motor assembly and refrigeration section jacket.
14. Refit air inlet louver and jacket top.
15. Restore power. The refrigeration plant should commence operation.

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the air inlet louver (refer to Procedure 10).
4. Recover refrigerant from sealed refrigeration system.
5. Undo the compression nuts on the inlet and outlet of the receiver/filter drier.
6. Cut the cable tie and remove the receiver/filter drier.
7. Fit the replacement receiver/filter drier, secure using a cable tie and retighten the compression fittings.
8. Pressurise system to 3000kPa and conduct a leak test.
9. Evacuate system to 100 microbar (30”) for a period of at least 30 minutes.
10. Recharge system with the correct refrigerant. Refer to “Specifications – Refrigeration System” table on page 3.
11. Refit air inlet louver and jacket top.
12. Restore power. The refrigeration plant should commence operation after a 30 second delay.

Compressor and Accumulator (Procedure 21)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration section jacket (refer to Procedure 11).
4. Remove the evaporator shroud and fan motor assembly (refer to Procedure 12 Steps 3 - 6).
5. Recover refrigerant from sealed refrigeration system.
6. Disconnect the wiring to the compressor and unclip and remove the compressor T sensor from the compressor discharge pipe work.
7. Remove the pipe insulation to expose pipe work at the compressor and accumulator. Un-braze the discharge pipe-work from the compressor and the suction line from the accumulator.
8. Remove the 3 nuts retaining the compressor to the chassis and lift the compressor and accumulator clear.
9. Fit and secure the replacement compressor and accumulator, braze pipe work, reconnect wiring to the compressor and refit the discharge T sensor and retaining clip.
16. Replace the receiver/filter drier (Refer to Procedure 20 – steps 4 to 7).
10. Pressurise system to 3000kPa and conduct a leak test. Refit and secure pipe work insulation.
11. Evacuate system to 100 microbar (30”) for a period of at least 30 minutes.
12. Recharge system with the correct refrigerant. Refer to “Specifications – Refrigeration System” table on page 3.
13. Refit the evaporator shroud and fan motor assembly and refrigeration section jacket.
14. Refit air inlet louver and jacket top.
15. Restore power. The refrigeration plant should commence operation after a 30 second delay.

TX Valve Replacement (Procedure 22)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

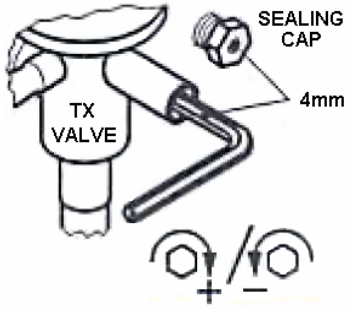
1. ***Isolate the power to the water heater***.
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Remove the refrigeration section jacket (refer to Procedure 11).
4. Recover refrigerant from sealed refrigeration system.
5. Remove the pipe insulation to expose pipe-work at the TX valve assembly and the TX valve sensor.
6. Separate the TX valve sensor and capillary from the suction line.
7. Un-braze the pipe-work and remove the TX valve.
8. Braze the replacement TX valve into place and attach the sensor to the suction line. Note: Ensure the sensor bulb is in good contact with the suction line.
9. Replace the receiver/filter drier (Refer to Procedure 20 – steps 4 to 7).
10. Pressurise system to 3000kPa and conduct a leak test. Refit and secure the pipe work insulation.
11. Evacuate system to 100 microbar (30") for a period of at least 30 minutes.
12. Recharge system with the correct refrigerant. Refer to "Specifications – Refrigeration System" table on page 3.
13. Restore power. The refrigeration plant should commence operation after a 30 second delay.
14. Refit air inlet louver and jacket top.
15. Adjust TX valve if required (Refer to Procedure 23).

TX Valve Adjustment (Procedure 23)

Components within the refrigeration plant section will be "live" during the adjustment process. Wear Personal Protective Equipment to reduce the risk of electric shock.

The TX valve is supplied preset and should be installed with the factory setting (6ºC) unaltered. This setting is calibrated for the lowest superheating and optimum evaporator utilization. However, should it be necessary to adjust the superheat, turn the adjusting spindle as follows: Clockwise = Reduced refrigerant flow, increase of superheat. Anticlockwise = Increased refrigerant flow, decrease in superheat.

1. Remove the air inlet louver (refer to Component Replacement - Procedure 10).
2. Remove the TX valve sealing cap (see diagram opposite).
3. Using a 4mm Allen key back the TX valve adjuster screw anticlockwise all the way out. Note: The adjuster screw is recessed approximately 8mm.
4. Screw the adjuster screw in three full turns to achieve the required superheat setting of +6ºC. Note: 1 full 360º turn of the adjuster screw = 2ºC.
5. Refit and tighten the TX valve cap to a torque of 4Nm.



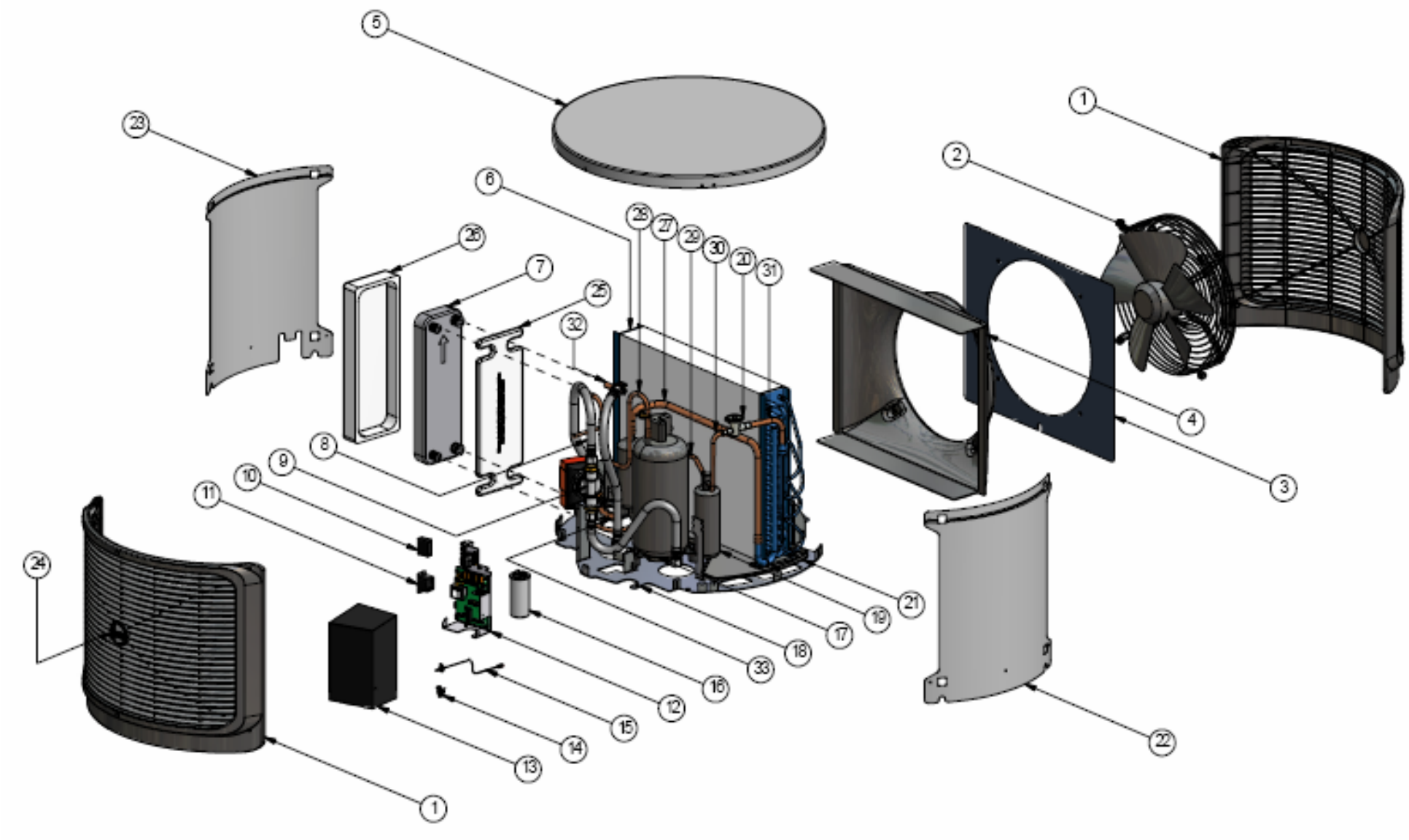
Heat Exchanger (Procedure 24)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

A quantity of hot water may discharge from the flexible hose(s) during this procedure. Wear Personal Protective Equipment to prevent scalds or burns and ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Remove the access cover and confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the cylinder through the T & PR valve.***
4. Remove the refrigeration section jacket (refer to Procedure 11).
5. Recover refrigerant from sealed refrigeration system.
6. Undo flexible hose unions at heat exchanger. ***Note: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.***
7. Remove insulation from refrigeration pipe work to and from the heat exchanger and remove inlet and outlet water sensors.
8. Cut cable ties and remove heat exchanger styrene insulation.
9. Un-braze refrigeration pipe work from heat exchanger and remove heat exchanger.
10. Un-braze water system inlet and outlet pipe work from old heat exchanger and braze these components on to the new heat exchanger.
11. Braze the replacement heat exchanger (refrigeration pipe work) into place.
12. Refit inlet and outlet water sensors and replace pipe work and heat exchanger insulation.
13. Remake flexible hose connections to heat exchanger.
17. Replace the receiver/filter drier (Refer to Procedure 20 – steps 4 to 7).
14. Pressurise system to 3000kPa and conduct a leak test. Refit and secure the pipe work insulation.
15. Evacuate system to 100 microbar (30”) for a period of at least 30 minutes.
16. Recharge system with the correct refrigerant. Refer to “Specifications – Refrigeration System” table on page 3.
17. Restore water supply and bleed air from the heat exchanger water outlet union. ***Note: Ensure all escaping water is caught in a container to prevent the sensor strip from becoming water damaged.***
18. Restore power. The refrigeration plant should commence operation after a 30 second delay.
19. Adjust TX valve (Refer to Procedure 23).
20. Refit refrigeration jacket (reverse procedure 11).
21. Restore water and power supplies. The refrigeration plant should commence operation after a 30 second delay.

Exploded View - Refrigeration Plant

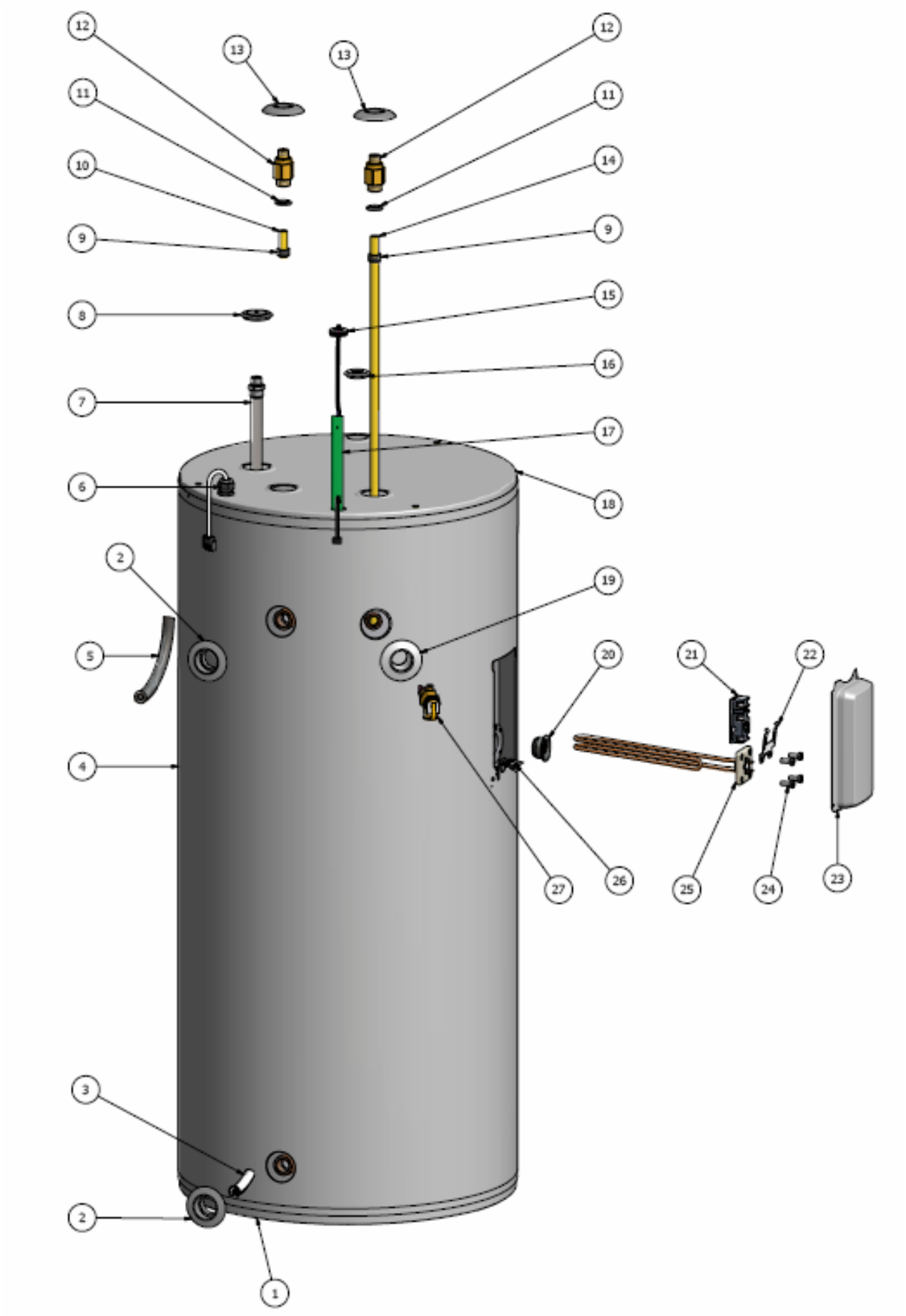


Replacement Parts List – Refrigeration Plant

Item	Description	Part Number
1	Air Grille	104798
2	Fan Motor Assy	180027
3	Air Shield	108374
4	Fan Shroud	180026
5	Jacket Top	100659
6	Evaporator Coil	180025
7	Condenser	180032
8	Hose – Braided	088086
9	Circulator	051575
10	Capacitor – Fan Motor	890374
11	Relay	052123
12	Controller Assy	051577
13	Control Cover	051659
14	Sensor Clip	890263
15	Sensor	056006
16	Capacitor - Compressor	890373
17	Compressor	180029
18	Chassis Assy	140114
19	Receiver/Filter Drier	180021
20	TX Valve	180024
21	Drip Tray	104797
22	Side Cover	108372
23	Side Cover - Drip tray outlet	108373
24	Label – Air Grille	120513
25	Condenser Insulation	090249
26	Condenser Insulation Cover	090250
27	Pipe – Refrigerant, Low Pressure	181526
28	Pipe – Refrigerant, High Pressure	181527
29	Pipe – Refrigerant, Drier to Heat Exchanger	181528
30	Pipe – Refrigerant, Drier to TX	181529
31	Pipe – Refrigerant, TX to Evaporator	181530
32	Pipe – Condenser, Upper Water with Thermistor Holder Fitting	088096
33	Pipe – Condenser, Lower Water with Thermistor Holder Fitting	088098
NS	Heat Pump Module to Water Heater Mounting Screws (pkt of 3)	080156

NS = Not shown

Exploded View - Water Heater



Replacement Parts List – Water Heater

Item	Description	Part Number
1	Jacket Bottom	100633
2	Pipe Seal – Inlet/Outlet (¾" x 38)	221418
3	Inlet Diffuser	220516
4	Name Band	120512
5	Dip Tube (Outlet)	225601
6	Wiring loom assembly	N/A
7	Anode – Black	221904
	Anode – Blue	221924
	Anode – Green	222024
8	Anode Cover	221720-1
9	Dropper Tube Seal	087027
10	Dropper Tube – Short	220558
11	O-ring – Dropper Tubes	087023
12	Fitting ¾" to ½" Brass	088040
13	Pipe Seal – Dropper Tubes (30 x 16)	221233
14	Dropper Tube – Long	220559
15	Grommet - Sensor Strip	080149
16	Foam Cover	221735
17	Sensor Strip	053053
18	Jacket Top	108375
19	Pipe Seal – T & PR (½" x 38)	221420
20	Element Gasket	050704
21	Thermostat – EWT 1L2-561	051571
22	Thermostat Clamp	102501
23	Access Cover	100703-1
24	Element Bolts	051404
25	Element 2.4kW	050324
	Element 3.6kW	050323
26	Terminal Block	051521
27	T & PR Valve HTE523/507	220641

Rheem Electric Water Heater Warranty - (Australia Only)

WARRANTY CONDITIONS

1. This warranty is applicable only to water heaters manufactured from 1st September 2006.
2. The water heater must be installed in accordance with the Rheem water heater installation instructions, supplied with the water heater, and in accordance with all relevant statutory and local requirements of the State in which the water heater is installed.
3. Where a failed component or water heater is replaced under warranty, the balance of the original warranty period will remain effective. The replaced part or water heater does not carry a new warranty.
4. Where the water heater is installed outside the boundaries of a metropolitan area as defined by Rheem or further than 25 km from a regional Rheem branch office, or an Accredited Service Agent, the cost of transport, insurance and travelling costs between the nearest Rheem Accredited Service Agent's premises and the installed site shall be the owner's responsibility.
5. Where the water heater is installed in a position that does not allow safe, ready access, the cost of accessing the site safely, including the cost of additional materials handling and / or safety equipment, shall be the owner's responsibility.
6. The warranty only applies to the water heater and original or genuine (company) component replacement parts and therefore does not cover any plumbing or electrical parts supplied by the installer and not an integral part of the water heater, e.g. pressure limiting valve; isolation valves; non-return valves; electrical switches; pumps or fuse.
7. The water heater must be sized to supply the hot water demand in accordance with the guidelines in the Rheem water heater literature.

WARRANTY EXCLUSIONS

REPAIR AND REPLACEMENT WORK WILL BE CARRIED OUT AS SET OUT IN THE RHEEM WATER HEATER WARRANTY ABOVE HOWEVER THE FOLLOWING EXCLUSIONS MAY CAUSE THE WATER HEATER WARRANTY TO BECOME VOID AND MAY INCUR A SERVICE CHARGE AND / OR COST OF PARTS.

a) Accidental damage to the water heater or any component, including: Acts of God; failure due to misuse; incorrect installation; attempts to repair the water heater other than by a Rheem Accredited Service Agent or the Rheem Service Department.

b) Where it is found there is nothing wrong with the water heater; where the complaint is related to excessive discharge from the temperature and / or pressure relief valve due to high water pressure; where there is no flow of hot water due to faulty plumbing; where water leaks are related to plumbing and not the water heater or water heater components; where there is a failure of gas, electricity or water supplies; where the supply of gas, electricity or water does not comply with relevant codes or acts.

c) Where the water heater or water heater component has failed directly or indirectly as a result of: excessive water pressure; excessive temperature and / or thermal input; blocked overflow / vent drain; corrosive from the water heater.

d) Where the water heater is located in a position that does not comply with the Rheem water heater installation instructions or relevant statutory requirements, causing the need for major dismantling or removal of cupboards, doors or walls, or use of special equipment to bring the water heater to floor or ground level or to a serviceable position.

e) Repair and / or replacement of the water heater due to scale formation in the waterways or the effects of either corrosive water or water with a high chloride or low pH level when the water heater has been connected to a scaling or corrosive water supply or a water supply with a high chloride or low pH level as outlined in the Owner's Guide and Installation Instructions booklet.

f) Breakage of collector glass for any reason including hail damage. (We suggest that the collector glass be covered by your home insurance policy).

SUBJECT TO ANY STATUTORY PROVISIONS TO THE CONTRARY, THIS WARRANTY EXCLUDES ANY AND ALL CLAIMS FOR DAMAGE TO FURNITURE, CARPETS, WALLS, FOUNDATIONS OR ANY OTHER CONSEQUENTIAL LOSS EITHER DIRECTLY OR INDIRECTLY DUE TO LEAKAGE FROM THE WATER HEATER, OR DUE TO LEAKAGE FROM FITTINGS AND / OR PIPE WORK OF METAL, PLASTIC OR OTHER MATERIALS CAUSED BY WATER TEMPERATURE, WORKMANSHIP OR OTHER MODES OF FAILURE.

Rheem Australia Pty Ltd
A.B.N 21 098 823 511

FOR SERVICE TELEPHONE
131 031 AUSTRALIA
or refer local Yellow Pages

Document Revision History

Title Service Instructions for Rheem Heat Pump		**Document Number** TM025
Revision	**Details of change**	**D.O.I.**
A	Service Instructions issued for 310 Series Heat Pump	03/07
B	Addition to flow diagram	08/07